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Environmental Assessment

Yates Petroleum Corporation Thunder Basin Coal Bed Methane Development Project

Douglas Ranger District, Medicine Bow-Routt National Forests and
Thunder Basin National Grassland, Campbell County, Wyoming

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SUMMARY

The Douglas Ranger District of the Medicine Bow-Routt National Forests and Thunder Basin National Grassland is considering a proposal by Yates Petroleum Corporation (Yates) to develop ten (10) coal bed methane (CBM) gas wells on National Forest System (NFS) Lands. The proposed wells are located within one plan of development (POD). All ten (10) wells are proposed on the Thunder Basin POD, which is located in sections 7, 9, and 18 of T42N, R70W, and Section 13 of T42N, R71W.

Through this environmental effects analysis process, the Forest Supervisor will determine where and under what terms and conditions Yates may occupy the surface to develop their gas leases while protecting natural resources, and providing for public access and safety. In addition, the BLM Buffalo Field Office Manager will utilize this EA to determine the conditions under which Yates may exercise their federal mineral leases. This decision implements the *Revised Land and Resource Management Plan for the Thunder Basin National Grassland* (herein referred to as the Grassland Plan) (USDA FS 2002b). The analysis documented in this environmental assessment tiers to the analyses and findings contained and documented in the *Final Environmental Impact Statement for the Northern Great Plains Management Plans Revisions* (USDA FS 2002a) and Thunder Basin Land and Resource Management Plan and *Record of Decision* (USDA FS 2002b) and adopts and incorporates by reference portions of the Final Environmental Impact Statement and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project (herein referred to the Powder River Basin EIS); and incorporates by reference other applicable laws and regulations. Surface developments are required to be consistent with direction contained in the Grassland Plan and existing leases.

Alternative A, the Proposed Action, involves the construction of 10 CBM wells with ancillary facilities and pipelines to be drilled on 80-acre spacing. Wells would be drilled to a maximum depth of approximately 700 feet. The production facilities at the well would consist of the wellhead and an insulated wellhead cover. In addition, each productive well would require the installation of an electric submersible pump below ground level that would be used to dewater the coal seams. Dewatering would be necessary to lower pressure within the coal seams and allow methane to be recovered. Once wells become operational, produced waters would be separated from the gas and collected in a buried polyethylene flow line (pipeline) for transportation to an approved outfall. As shown on the development maps, produced water flow lines and gas flow lines would be co-located adjacent to the two-track access route where feasible. Under Alternative A, approximately 5.59 miles of roads would be used as access routes to the 10 proposed well sites and associated facilities. This would include the use of 2.45 miles of existing unimproved two-track roads, the use of 1.4 miles of existing all-weather roads, and the construction of 1.74 miles of new, unimproved two-track road. Total length of pipeline and utility corridor trenching (gas, water and electricity) would be 6.65 miles. Trenches for the pipelines would be constructed adjacent to access roads where possible.

Two skid-mounted central gathering/measurement facilities are proposed. New underground electrical lines would be constructed to provide electricity from existing power lines on adjacent fee lands to the central gathering facility in the Plan of Development (POD). One new overhead power line would be constructed by the local utility company, on private land, to provide electrical service to one (1) power drop. A second power drop, from an existing overhead power line, would be located on NFS surface as shown on Map D of the POD section 7. Temporary natural gas-fired electric generators would be utilized for one to two years until line power is available.

The management plan for CBM water is to temporarily contain most of the produced water within one reservoir on NFS land in the lease area. It is anticipated that water produced as a result of CBM production would not be discharged into live waters, except during periods of rain or snowmelt, because of evaporation and infiltration. One (1) existing reservoir on NFS lands would be utilized, on the Thunder Basin POD, and would be upgraded to Forest Service standards by removing silt and the addition of trickle tubes, as necessary. An existing drainage on private surface would act as a discharge point as approved by the surface owner.

The total amount of proposed surface disturbance under Alternative A is anticipated to be consistent with estimates provided in the Powder River Basin EIS (USDI BLM, 2003, Pages 2-19 and 2-21). Total long-term surface disturbance due to well drilling, pipeline/utility corridors, access roads, and central gathering facilities under the Proposed Action would be 13.97 acres.

The coal bed methane wells that would be drilled and developed by the implementation of this proposed action are 10 wells included as existing developments in the Powder River Basin EIS Reasonable Foreseeable Development Scenario that projects total development of an estimated 51,000 coal bed methane wells.

In addition to the Proposed Action, this Environmental Assessment also evaluates Alternative B, the No Action Alternative.

Under the No Action Alternative, Yates would not develop the CBM minerals in their Thunder Basin leases. CBM minerals from the project area would continue to be drained from un-drilled federal mineral acreage, resulting in a loss of revenues for the public estate. The habitat proposed for disturbance under the Proposed Action would remain undisturbed by CBM development. Should the No Action Alternative for this CBM project be exercised, the project area would still likely be mined for coal in the near future.

This Environmental Assessment (EA) complies with the requirements of the National Environmental Policy Act of 1969 as amended (NEPA), and the Office of the Presidents Council on Environmental Quality regulations for implementing the Act. This EA documents the environmental effects analysis of Yates's proposal to develop CBM wells in the Thunder Basin POD on NFS Lands. The EA includes a description of the proposal, the purpose and need for the action, the public issues identified regarding the actions, the alternatives to the Proposed Action that were considered, the affected environment and the environmental consequences of implementing the proposal or any alternatives to it that were developed in detail.

This EA is not a decision document. It is a document disclosing environmental consequences of implementing the Proposed Action and No Action Alternative. The consideration of the No Action Alternative is required by CEQ regulation, however Yates's mineral leases in the Thunder Basin project area grants the company the "right and privilege to drill for, mine, extract, remove and dispose of all oil and gas deposits" in the leased lands, subject to the terms and conditions incorporated in the federal leases.

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1.0 INTRODUCTION

1.1 DOCUMENT STRUCTURE

The USDA Forest Service (FS), Douglas Ranger District has prepared this EA in compliance with NEPA and other relevant federal and state laws and regulations. The Forest Service and Bureau of Land Management (BLM) work together through an Interagency Agreement dated 11/19/1991 to coordinate administration of oil and gas operations on Federal leases within the National Forest System. This EA discloses the direct, indirect, and cumulative environmental impacts that could result from the Proposed Action and alternatives. The document is organized into six (6) parts:

- 1. Introduction:* The section includes information on the history of the project proposal, the purpose of and need for the project, and Yates's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.
- 2. Comparison of Alternatives, including the Proposed Action:* This section provides a more detailed description of the agency's Proposed Action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on an on-site review of the project area by the FS, and because of issues raised by the public and other agencies. This discussion also includes possible impact avoidance and mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative. Maps of each alternative are provided in Appendix A.
- 3. Forest Plan Consistency and Compliance:* This section describes the management area prescription and desired conditions for the project area under the Grassland Plan (USDA FS 2002b).
- 4. Environmental Consequences:* This section describes the environmental consequences of implementing Alternatives A or B. This analysis is organized by a brief description of the resource issue followed by an analysis of potential impacts under each alternative.
- 5. Agencies and Persons Consulted:* This section provides a list of preparers and agencies consulted during the development of the environmental assessment.
- 6. Appendices:* The appendices provide more detailed information to support the analyses presented in the environmental assessment.

Additional documentation such as the Water Management Plan; the Biological Assessment, Biological Evaluation and Appraisal of Management Indicator Species; and Cultural Resources Report may be found in the project planning record for this EA. The project planning record is located at the Douglas Ranger District Office in Douglas, Wyoming.

1.2 BACKGROUND

The production of coal bed methane (CBM) in Wyoming has increased dramatically in the last 5 years. CBM leasing activities, development of leases, and production from those existing leases continues to occur in the eastern Powder River Basin (PRB) of Wyoming. At present,

CBM development in the Powder River Geologic Basin is the most active onshore oil and gas development within the continental United States. Numerous oil and gas companies, including Yates, have developed or are planning new coal bed methane projects for this region.

The Thunder Basin project area (see Project Area Map) is located within the analysis area boundaries of the Powder River Basin EIS as previously cited (USDI BLM 2003 pg. 1-3).

1.3 PURPOSE & NEED FOR ACTION

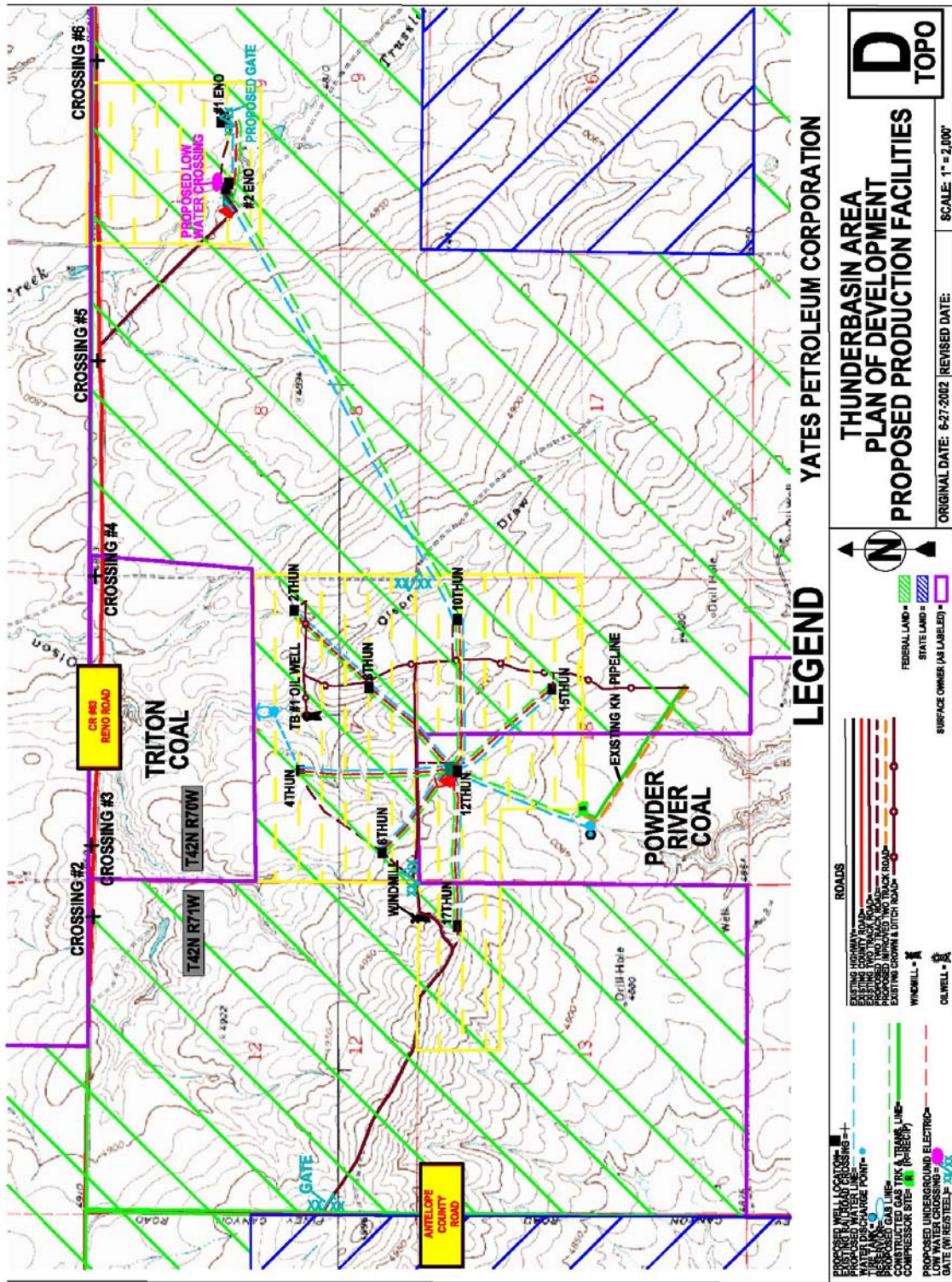
The purpose of this project is to implement those programmatic Forest Service and BLM decisions to make the minerals underlying this leasehold available to the people of the United States. The leasing decision determined development of these mineral resources is in the best interest of the public. Also, its purpose is to allow Yates surface occupancy to exercise lease rights granted by the United States of America to develop the oil and gas resources on these leaseholds.

The project is needed to provide for the national need for an ongoing stable domestic energy supply. Currently, CBM in the Thunder Basin National Grassland is being drained from federal mineral acreage over large areas by wells on fee and State lands. Drainage from un-drilled federal mineral acreage represents a large transfer of wealth from the public estate to the non-federal estate owners and a potential loss of methane resources. Thus, this action is also needed to recover the CBM gas from the public estate before it drains to the non-federal estate and public revenues are lost. Drainage only removes a portion of the CBM from the federal estate, but in many instances enough of the CBM is drained so that what is remaining is not economical or practical to recover, thus resulting in a net loss of natural gas that would be available to the people of the USA. Yates's plan of developing CBM wells on NFS Lands would return royalties to the Federal Treasury before methane resources are lost to other coal bed methane developers.

The lease area would accommodate up to 10 wells in compliance with State of Wyoming spacing requirements. The leases that would be developed under this decision include: WYW-008396 (issued 1967) and WYW-140760 (issued 1997). The earlier leases were issued prior to the Medicine Bow National Forest Plan and the Thunder Basin National Grassland Land and Resource Management Plan of 1985 (1985 Plan) and the Grassland Plan. The 1997 leases were authorized for issuance under the Record of Decision, 1994 Thunder Basin National Grassland Medicine Bow National Forest Oil and Gas Leasing Final Environmental Impact Statement that amended the 1985 Plan.

The Record of Decision for the 2002 Thunder Basin National Grassland Land and Resource Management Plan (USDA FS 2002a) acknowledges on pages 18 and pages 42-43 the existing lease rights held by Yates Petroleum Corporation will be honored. New stipulations in the Grassland Plan would not apply to the Yates leases identified above if they would be inconsistent with the rights granted under those leases, because they were issued before the date of the decision that implements the current plan.

PROJECT AREA MAP



1.4 ENVIRONMENTAL ANALYSIS PROCESS

The FS, as authorized by the Council for Environmental Quality (CEQ) and the National Environmental Policy Act (NEPA) directives, analyzes actions involving federal lands to determine their impact on the human environment (40 CFR, Parts 1500-1508). Since the USDI BLM is responsible for the mineral leases associated with FS lands, BLM is a cooperating agency with the FS for this EA. Prior to issuing decisions on the Yates proposal, the FS must comply with the requirements of NEPA. NEPA requires Federal agencies to use a systematic, interdisciplinary approach to ensure the integrated use of natural and social sciences in planning and decision making. NEPA also directs that an environmental analysis of proposed Federal actions must be completed to determine reasonable alternatives and effects of the federal action on the environment. The analysis is to determine whether approval of the proposed action would constitute a "major" federal action significantly affecting the human environment. The evaluation of the proposed action and project alternatives was conducted by an interdisciplinary team with representatives from the FS and a third-party contractor approved by and working under the direction of the FS. The evaluation of this proposal and alternatives was developed through interdisciplinary field review with representatives from Yates, the FS, and the project interdisciplinary team (IDT). Also, for purposes of this EA, reference to Yates, as the project proponent, includes all contractors, subcontractors or other parties that would be involved in the layout, construction, and operation of the proposed CBM Project.

Factors considered during the environmental analysis process regarding the exploratory CBM project include the following:

- A determination of whether the proposal and alternatives are in conformance with FS policies, regulations, and approved land and resource management plan direction.
- A determination of whether the proposal and alternatives are in conformance with policies and regulations of other agencies likely associated with the project.
- The location of environmentally suitable well pad locations, access roads, pipelines, and production facilities that best meet other resource activities and minimize surface resource impacts yet honor the lease rights within the project area.
- A determination of impacts resulting from the proposed action and alternatives on the human environment, if conducted in accordance with applicable regulations and lease stipulations, and the development of mitigation measures necessary to avoid or minimize these impacts.

This EA is not a decision document. It documents the process used to analyze the potential impacts of the proposed action and alternatives and discloses the effects of the proposed action and alternatives to that action. A Decision Notice and Finding of No Significant Impact (FONSI), signed by the FS responsible official, will document the final decision regarding the selected alternative. The FS will document whether or not significant impacts would occur with implementation of any of the alternatives. If the FS determines that no significant impacts would occur, a Finding of No Significant Impact (FONSI) and Decision Notice would be issued. If significant impacts are identified, the FS decision would be to complete an EIS, with subsequent public input and additional analysis of the alternatives. The FS decision will relate to FS administered lands. Decisions by the responsible official regarding the use of transportation

networks in the project area by Yates may affect private land owners, county administration of these roads, and public access to FS administered lands.

This EA will guide the implementation of a selected alternative and will facilitate preparation of additional environmental analyses within the project area and adjacent lands. This EA is *not* the final environmental review upon which approval of all actions in the project area will be based. A project environmental review will be done by the Bureau of Land Management prior to their approval of an Application for Permit to Drill (APD) and Sundry Notices. That site specific analyses will adopt the analyses presented in this EA.

1.5 PUBLIC INVOLVEMENT

The Council on Environmental Quality (CEQ) regulations require an “early and open process for determining the scope of issues to be addressed and for identifying significant issues related to a Proposed Action” (40 CFR 1501.7). In order to satisfy this CEQ requirement, the Responsible Official selected an Interdisciplinary (ID) Team and “charged” that team to scope with the public to determine their concerns and issues with Yates’s proposal, develop alternatives to the proposal that respond to those issues, to analyze the environmental effects of the proposed land exchange and to prepare the environmental document. The ID Team reviewed existing information about the project area and actions similar to the proposal.

The public scoping statement addressing the Proposed Action was mailed to 111 organizations, agencies and individuals listed as parties interested in proposed activities on the Thunder Basin National Grassland, as well as to parties that may be affected by the Proposed Action, including adjacent landowners, tribal governments, the Campbell County Commissioners, the Wyoming Governor’s Office and the Congressional Delegation on March 28, 2003 and was published in the *Casper Star Tribune* on April 2, 2003. A complete mailing list is provided in Appendix B.

Nine comment letters were received as a result of the scoping effort. Using the comments from the public and other agencies, the interdisciplinary team developed a list of issues and concerns to address and responses to each of these issues (Appendix C).

1.6 PUBLIC ISSUES AND CONCERNS

The FS separated the issues into four categories. 1) Those that drive alternative development. 2) Those that are analyzed in the Environmental Consequences (Chapter 4). 3) Those already decided by law, regulation, Grassland Plan, or other higher level decision. 4) Those outside the scope of the Proposed Action.

The USFS identified a number of issues raised during scoping. These issues were organized by resources areas. Issues identified are summarized and listed by resource area in Table 1-1.

Table 1-1. Issues identified during scoping.

GEOLOGY, PALEONTOLOGY, MINERALS AND GEOLOGIC HAZARDS	Whether or not employment of directional/horizontal drilling technology allows for a feasible alternative for coal bed natural gas drilling; and whether or not, regardless of the cost, the FS should force Yates to use directional/horizontal drilling techniques.
	Whether or not the proposal will have any adverse impact on human health or safety.
	Whether or not, to assist in addressing potential impacts to fish and wildlife resources resulting from hydrogeological processes affected by CBM development, that a stratigraphic profile of the proposed well field containing information on well depth and major geological formations that would be penetrated during drilling should be provided.
	Whether or not the EA will include a brief description of the central gathering and metering facilities, both on Federal and private land with regards to the projects cumulative impacts.
	Whether or not the three dimensions of a pit needs to be included in the analysis instead of two dimensions and whether or not it should be specified what is to be done with pit fluids before back filling the pit.
	Whether or not every effort should be made to minimize the area of disturbed land.
	Whether or not as dewatering of CBM aquifers continues more coal will be exposed to the air, thereby increasing the risk of coalbed fires.
	Whether or not the EA will include a brief description of the central gathering and metering facilities, both on Federal and private land with regards to the projects cumulative impacts.
	Whether or not even though drilling and down hole operations are the responsibilities of the BLM, these actions need to be described in the EA as part of the effects discussion for this project.
	Whether or not it is unfortunate that existing laws allow mineral leasing for mining by private parties “despite the destruction done to the public’s environment”.
	Whether or not sedimentary rocks of chemical or biochemical origin (e.g. limestone, dolomite, gypsum), which can “redissolve”, would allow produced water to migrate through them potentially contaminating other aquifers.
SURFACE WATER	Whether or not the proposal will have cumulative adverse impact(s) on water quality and downstream uses of water, including impact on irrigated crops that may occur downstream (i.e. the Cheyenne River or any affected tributaries) from CBM produced discharge points.
	Whether or not peer-reviewed science should underlie decisions and that science should be indemnified in the decisions and discussions regarding this project, especially regarding the disposition of water from the CBM wells.

	Whether or not reinjection of produced water is a feasible alternative to surface discharging.
	Whether or not the water quality, to include the potential salinity, SAR values, and trace elements such as selenium, arsenic, barium and zinc, of discharged produced water would have adverse impacts on endangered and non-endangered vegetation and wildlife, aquatic life, domestic livestock, and agricultural crops. Also whether or not there would be any adverse impacts to the soil. These concerns are for the immediate area as well as those areas down stream that may be impacted and whether or not the USFS will comply with all federal, state, and local requirements respecting the control and abatement of water pollution.
	Whether or not the water discharge point on private land will be discussed, especially in the direct and cumulative impacts of the entire project and the watershed analysis area.
	Whether or not the connected action of upgrading the reservoir must also be described in the EA., to include both direct and indirect cumulative impacts that water management could have on receiving aquatic and terrestrials systems.
	Whether or not a reservoir modified to allow a flushing flow is more likely a downgrade rather than an up grade and Whether or not that water which may be flushed through the reservoir, would require further [water discharge] permits.
	Whether or not increased sodium concentration leads to clay deflocculation, which would cause accelerated physical erosion. And whether or not with CBM water discharge into unlined reservoirs within a drainage channel modified “to allow discharge water to flow through in a flushing manner” would increase sodium concentrations thereby accelerating physical erosion of earthen dams with high clay content causing them to leak or fail.
	Whether or not discharge of CBM water into stream channels will lead to radical flow increases thereby causing attendant acceleration of erosion and channel widening and straighten, or “channelization” which will increase the likelihood of future flash flooding.
	Whether or not any adequate NEPA document must analyze all known effluents (particularly salinity and sodium absorption rate (SAR) values) with sufficient samples (region wide) to test by-product water from the depth of the actual coal seams.
GROUND WATER	Whether or not the problem of aquifer recharge in relation to landowners’ wells “that have gone dry as a direct result of aquifer depletion” and how long it will take to recharge aquifers will be addressed.
	Whether or not the issues of permeability, long time recharge, nature of recharge, and potential sub-strata subsidence (i.e. the collapse of an entire depleted aquifer) will be addressed.

	Whether or not aquifers in different geologic strata are not watertight units, and whether or not coalbed methane development might dewater the target coal seam, but also dewater and/or contaminate neighboring aquifers (above or below) with natural gas or other pollutants.
AIR QUALITY	And using natural gas powered generators with high quality mufflers, instead of diesel, to reduce toxic emissions and keep noise to a minimum.
	Whether or not toxic emissions for generators (especially diesel), including sulfur dioxide, nitrous oxide, carbon monoxide carbon dioxide, and formaldehyde will be addressed. And whether or not the proposed action would contribute to significant air quality concerns.
	Whether or not air quality as it affects wildlife, vegetation, human health.
ANALYSIS AND CUMULATIVE IMPACTS	Whether or not, since this project is one of a series of CBM developments within the Thunder Basin National Grasslands, the USFS should consider consolidating these requests into a larger, more comprehensive NEPA document that would address the cumulative impacts of CBM activity within this area. And whether or not we can continue to ignore these issues by fragmenting the comments & impacts into small lessee based parts, which serves the minimize landscape level impacts and those environmental changes that are most damaging from that point of view on private, BLM and FS lands.
	Whether or not this project is an illegal fragmentation in violation of 40 CFR 1506.1 whereby any project in the Powder River Basin must consider the impacts from the reasonable, foreseeable development of all the 51000 CBM wells in the Powder River Basin and analyze the cumulative impacts of these wells. The commenter states that the PRB EIS must be completed before this project can analyze the cumulative impacts.
	Whether or not the NEPA analysis should disclose the full extent of proposed development as well as direct and indirect effects of all aspects of the project and the cumulative impacts of past, present and reasonably foreseeable future actions. And whether or not cumulative impacts on all resources would be addressed in the EA.
	Whether or not the proposal, "as presented in the scoping statement, is as though there were only 10 wells in the Thunder Basin. The reclamation and drilling need to specifically take into account the large number of wells in the geographical area. It is important that these wells not be treated & proposed in isolation, but should take the cumulative impact of all wells in the Thunder Basin."
	Whether or not the analysis of the cumulative effects of this proposal will adequately consider the impacts from all reasonably foreseeable CBM development in the Powder River Basin on federal, state and private land "which is estimated to be between 51000 and 139000 wells".

	Whether or not the NEPA analysis (EA) should be deferred to the APD level.
	Whether or not the USFS recognizes that it has the authority to impose reasonable mitigation measures with which it can require important mitigation measures to limit or eliminate adverse impacts as per 43 CFR 3101.1-2.
	Whether or not this EA “should be tiered to the Wyoming Powder River Basin (WPRB) FEIS, specifically, the water quality analysis for the Cheyenne River watershed water management plan, biological opinion, and air analysis. And whether or not this EA should present this information and/or list the pages of the FEIS on which the required information can be located.”
	Whether or not cumulative impacts should be identified if they extend beyond the Wyoming state line
	Whether or not a cumulative monitoring program for the region, to include private lands should be considered.
VEGETATION AND RECLAMATION	Whether or not the disturbed areas will/should be reclaimed with native soils and restored with native plants immediately after cessation of methane production.
	Whether or not the disturbance of this project will result in the invasion of noxious weeds (including salt tolerant weeds) resulting from loss of native vegetation. Also whether or not the land management plan implements the control of noxious weeds.
	Whether or not long-term drought will affect reclamation efforts, and if so, how will it affect those reclamation efforts?
	Whether sensitive, rare, and declining plant species (those listed from the data of the Wyoming Natural Diversity Database) inventories should be conducted in each project area prior to development. And whether or not potential impacts would be mitigated.
	Whether or not the USFS has/or will provide adequate, specific reclamation requirements. And if so, whether or not the disturbed areas will/should be reclaimed with the native soils and restored with native plants immediately after cessation of methane production.
	Whether or not the Forest Service should disclose the potential effects of herbicides that might be used to kill noxious weeds and are they general defoliant for all species, all dicots, or do they affect only the target species. If not, disclosure of the potential effects of the herbicide treatment within the project area should be disclosed.
WILDLIFE	Whether or not, and if so, how CBM impacts potential habitat to support the reintroduction of bison to this area in the future and whether or not the USFS must fully analyze impact to the possible reintroduction sites for the black-footed ferret.
	Whether or not sensitive species of fish and wildlife and their habitats should be identified and adequate buffer zones established to protect habitat from degradation.
	Whether or not the proposed action would adversely affect wildlife populations due to additional vehicle collisions.

	Whether or not the company should consider consolidating traffic to the site to decrease the number of potential collisions, decrease animal displacement, and best serve the national public.
	Whether or not the EA must also address important impacts to wildlife, sensitive, threatened and endangered species. Of particular concern are the black-tailed prairie dog, swift fox, sage grouse, mountain plover, ferruginous hawk, and the black-footed ferret.
	Whether or not the black-tailed prairie dog is a crucial “keystone species” within this prairie ecosystem, and if so, how the connection between the reduction of prairie dogs, the reduction of habitat diversity and the resulting decline in biodiversity affects the other species associated with or adjacent to prairie dog colonies, specifically such animals as the ferruginous hawk, the burrowing owl, the Swift fox, the sage grouse and the mountain plover.
	Whether or not seasonal ranges within the project area include yearlong ranges for the Thunder Basin Mule Deer Herd and winter/yearlong range for the Lance Creek Antelope Herd Unit exist.
	Whether or not there are known sage grouse leks within the sections proposed for drilling. Additional surveys for sage grouse leks and raptor nests should be done before fieldwork is permitted.
	Whether or not the proposal will have any adverse impact on vegetation, fish and wildlife (including burrowing animals) living in close proximity to CBM wells from methane gas migration.
	Whether or not since the presence and design of power lines is a potential concern for wildlife, in that, they have an impact on sage grouse (by providing raptor perches) and to raptors themselves (from electrocution) should power lines within the project area be buried to eliminate the impact on sage grouse?
	Whether or not the FS will use the new list of Threatened and Endangered Species of April 8, 2003 presented by DOI Fish and Wildlife Service as a general reference in this assessment. And whether or not the FS will implement the appropriate conservation measures as identified in the Biological Assessment and the USFWS’s December 17, 2002, Biological and Conference Opinion.
	Whether or not to provide information cumulative impacts to wildlife, baseline information for species of concern should be provided.
	Whether or not human activity, noise, and light disturbances will have an ongoing, direct effect on wildlife behavior and habitat throughout the area, the extent of which is crucial for understanding the full spectrum of effects associated with this project.
	Whether or not the proposal will pose a threat to wildlife by fragmenting the habitat due to disruption of seasonal migration routes, and breeding activities resulting from access roads, drill pads, pipelines, power lines, compressor stations, and increased traffic, etc.

CULTURAL RESOURCES	No substantive issues were noted.
LAND USE AND TRANSPORTATION	Whether or not, as recommended by the USFWS, the use of utility corridors to cluster gas pipelines, water pipelines, electric lines, and access roads, etc.
	Whether or not the discussion of total surface disturbance should include all infrastructure disturbances and their appropriate zones of influence and not be limited to actual, physical ground modifications.
	Whether or not, and if so, why are two track roads required to construct or service gas wells.
	Whether or not since one well is on private surface with Federal minerals (split estate) will the surface use agreement, water well agreements, bonding protection, etc. be addressed?
	Whether or not Congressional mandates, Federal statutes, and implementing regulation call for multiple uses, and these mandates, statutes and regulations should be integral part of the plans for the assessments.
	Whether or not since one well is on private surface with Federal minerals (split estate) will the surface use agreement, water well agreements, bonding protection, etc. be addressed?
	Whether or not the proposed plan should/would allow the USFS, BLM, grazing permittees, company officials and other agencies the opportunity to work cooperatively together (and on a continuing basis) with the flexibility to make the best site-specific, case-by-case decisions that are in the best interest of the affected resources and citizens. And whether or not it is imperative that FS officials have insured that all livestock grazing permittees that are directly or indirectly affected by this project are notified.
VISUAL RESOURCES	Whether or not visibility impairment of sensitive Class I and Class II areas will be addressed.
RECREATIONAL RESOURCES	No substantive issues were noted
NOISE	And using natural gas powered generators with high quality mufflers, instead of diesel, to reduce toxic emissions and keep noise to a minimum
SOCIOECONOMICS	Whether or not this project may affect grazing permittees, agriculture producers, landowners, and other citizens, as well as our natural resources over this area of our state. Specifically, the cumulative noise and water impacts on ranchers, agriculture producers, landowners, and grazing permittees.
	Whether or not, with grazing on public lands representing a vital economic value to agricultural producers and local communities, impacts on economic activity, specifically in and near the affected area, and any loss of environmental, historic, and social values of livestock grazing to the users, residents of impacted communities, and visitors to the area should be included in the scope of the study.
	Whether or not the proposed action will have an impact to local communities of temporary "boom time" workers.

2.0 COMPARISON OF ALTERNATIVES

This chapter describes and compares the alternatives considered for the Thunder Basin CBM development project. It includes a description of each alternative considered. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public.

2.1 ALTERNATIVE A – PROPOSED ACTION

Yates's proposed Thunder Basin POD is located southeast of Gillette, Wyoming and covers approximately 835 total acres of NFS lands of the Thunder Basin National Grassland in Campbell County (leases WYW-008396 & WYW-140760). The proposal for the POD includes drilling 10 CBM gas wells and the construction of ancillary facilities necessary to produce methane as described in the Powder River Basin EIS. The Thunder Basin POD is located in Sections 7, 9, and 18, T42N, R70W and Section 13, T42N, R71W. The leases are described in Table 2.1 below. Elements of the Proposed Action are summarized in Table 2.2. Wells, roads, pipelines, and other facilities under the Proposed Action are illustrated in the attached map for Alternative A (Appendix A). Roads, pipelines and other ancillary facilities that are not on the leases will be permitted under a Special Use Permit. On lease facilities would be approved via the APD by the BLM.

The coal bed methane wells that would be drilled and developed by the implementation of this proposed action are 10 wells included as existing developments in the Powder River Basin FEIS Reasonably Foreseeable Development Scenario that projects total development of an estimated 51,000 coal bed methane wells (Powder River Basin EIS, Appendix A).

The actions described in this alternative are consistent with the oil and gas lease stipulations described in each of the two lease documents.

Table 2.1 Lease Descriptions

Lease Number	Township	Range	Section	Q/Q	Lot	Acres
WYW-008396	42N	70W	7 18	NESE, NESW, SWSW, SWSE (sec.7) NENE, NENW, SWNE (sec. 18)	13,14,15,16,17,18 ,19,20 (sec.7) 5,6,11,12,8,7,10 (sec.18)	676.2 acres
WYW-008396	42N	71W	13	NENE	1,2	676.2 acres
WYW-140760	42N	70W	9	SENE, SENE	3,4,5,6 (NW ¼)	158.6 acres

Approximately 835 Total Acres of, or part of Leases on Forest Service System Lands within the Thunder Basin POD

2.1.1 Access Roads & Trenching

In total, approximately 5.59 miles of roads would be used as access routes to the 10 proposed well sites and associated facilities. This would include the use of 2.45 miles of existing unimproved, two-track roads (16-foot wide disturbance); 1.4 miles of existing all-weather (crown and ditch) roads (30-foot wide disturbance), and the construction of 1.74 miles of new, unimproved, two-track road (0.45 miles with utility corridor, 20-foot wide disturbance, and 1.29 miles without utility corridor, 16-foot wide disturbance).

Single trenches for pipelines and underground electric lines linking measurement buildings and their associated productive gas wells would be excavated along the access routes. Use of one trench to the extent possible would minimize disturbance of surface lands. Separate trenches would be used where utility gas and water lines diverge over to outfall locations.

Total length of pipeline and/or utility corridor trenching (gas, water and electrical lines) would be approximately 6.65 miles. The width of the pipeline/utility corridors would not exceed 16 feet, and would be constructed adjacent to access roads where feasible. The pipeline/utility corridor trenches would be constructed 1.6 miles along all-weather roads, within the previously discussed 30-foot wide ROW, thus, there would be no additional surface disturbance. A ten-foot wide corridor of surface disturbance would be constructed along the proposed two-track roads and in areas where trenches would not follow access roads. The 6.65 miles of trenching would therefore result in a short-term (2 – 3 years) surface disturbance of approximately 12.9 acres. Where lines are co-located, the trench would contain separate polyethylene pipes to transport methane and water away from the well sites to the measurement building and/or water discharge points, and underground electrical lines to provide power to the well sites. Utility corridor areas would be reseeded and reclaimed according to FS specifications in the first spring or autumn immediately following construction.

2.1.2 Wells

Wells would be drilled to an average depth of approximately 500 feet. Drilling operations would typically result in the short-term disturbance of approximately 0.06 acres per well site. Long-term disturbance would be limited to 0.003 acres per well site. Drilling rigs would be truck-mounted, water well type and would require little, if any, site preparation. A mud/cuttings pit approximately 10 feet by 20 feet by 6 feet deep would be constructed and then backfilled after the well is drilled. Typically, one backhoe and water truck would accompany the rig. A truck-mounted pulling unit would run down-hole production equipment. Topsoil would be stockpiled for site reclamation. The site and all disturbed areas would be reclaimed and reseeded in accordance with Forest Service requirements.

Wellhead production facilities at each well would require a level area of approximately 10 feet by 10 feet. The production facilities at the well would consist of the wellhead, an insulated wellhead cover, and ancillary facilities, which include but are not limited to electric panels and fencing. In addition, each productive well would require the installation of an electric submersible pump below ground level that would be used to produce water. Dewatering of the coal seams would be necessary to lower pressure within the seams and allow methane to be recovered. Once wells become operational, produced water would be separated from the gas and collected in a buried polyethylene flow line (pipeline) for transportation to an approved outfall. Where feasible, produced water flow lines and gas flow lines would be co-located adjacent to the two-track access route. No wellhead compression is anticipated.

The development plan is for 10 wells to be drilled on 80-acre spacing. Estimated water yield would be 11.5 gpm (gallons per minute) per well following drilling and would decline to 1.7 gpm per well after two years with continued decline after that. Estimated total initial water would be 11.5 gpm X 10 wells = 115 gpm (0.26 cubic feet per second) (Gene R. George & Associates, 2004, sec. 3.0).

2.1.3 Central Gathering/Measurement Facilities

Two skid-mounted central gathering/measurement facilities are proposed. Construction of the building site would result in the long-term disturbance of approximately 0.25 acres per facility. The proposed locations for the Thunder Basin POD Central Metering Facilities would be in the NW1/4SW1/4 of Section 18, T42N, R70W. The roads would typically serve as a common corridor for the gas, water, and electric lines. New underground electrical lines would be constructed to provide electricity from new and existing overhead and underground power lines to the central gathering facility in the POD. Temporary engine driven generation would supply electrical power to facilities until line power becomes available. Yates estimates that these generators would produce approximately 20 to 40 kW of electricity on a temporary basis.

One new natural gas engine driven compressor may be needed and would be located on private land. Compression would be accomplished by a third party contractor compressing gas for a number of developments in the area. Yates estimates that the horsepower required for their Thunder Basin POD would be 500 to 1,000 hp.

2.1.4 Water Management

The Water Management Plan describes how the CBNG project produced water would be managed in the Thunder Basin POD. Water would be discharged at two (2) separate locations in the POD area: (1) an existing in-channel reservoir on FS lands which drains into Olson Draw, a tributary to Trussler Creek, would be upgraded to store CBNG discharged water, and (2) Boss Draw, at an in channel point, located on private lands. The in-channel discharge in Boss Draw is at the request of The Powder River Coal Company for their dust suppression needs. (Gene R. George & Associates, 2004, sec. 3.1). To reduce erosion (reduce flow velocity) and oxygenate the water as it flows overland, the discharge spillways will be rip-rapped with gravel fill. In addition, at the request of the grazing lessee, two small volume, non-discharging stock tanks, which will be equipped with hydrants or floats to prevent discharge onto the ground surface, will be utilized. One of these tire tanks would be located in the NE1/4NW1/4 of section 18 on private land and the other would be located in the NW1/4NW1/4 of section 17. The existing reservoir on NFS lands in the Thunder Basin POD would be upgraded to Forest Service standards by removing silt and addition of a trickle tube, if necessary, to allow for periodical flushing flows at times of high stream flows. These high stream flows could possibly result in minimal amounts of CBNG water flowing downstream to main channels of the Little Thunder Creek to the northeast. Permits would be obtained from the State of Wyoming, State Engineers Office prior to reservoir upgrading, or before water produced from the CBM wells is stored and/or discharged into the existing reservoir or drainages.

Seepage measurements were made on CBM flows in Little Thunder Creek on September 12, 2001 (Lowham Engineering LLC, August 2002 pgs 05-06). Based on results of these measurements, and on a geohydrologic investigation of surface soils and geology of the project

area, seepage loss would be expected within and near the project area. Based on water quality data from nearby CBM developments, the quality of water in the reservoirs is expected to be suitable for livestock and wildlife use. (Gene R. George & Associates, 2004).

A detailed Water Management Plan for the POD for this EA is available in the project file at the Douglas Ranger District Office.

2.1.5 Erosion Control

Construction of roads, pipelines, gathering systems and central gathering facilities are planned so as to minimize surface disturbance and erosion. Erosion prevention measures would be used in the construction of the water outfalls above the reservoirs, and overall erosion-control plan were developed as part of the Water Management Plan for each POD. All applicable permits involving water storage and development would be obtained, including those with the Wyoming State Engineer (reservoirs) and Wyoming Department of Environmental Quality (NPDES permits and Storm-Water Drainage permit).

2.1.6 Disturbance Summary

The amount of surface disturbance is expected to be similar to estimates provided in the Final Environmental Impact Statement for the Powder River Basin Oil and Gas Project (USDI BLM 2003 pg 2-48—2-49). Short-term and long-term disturbances due to wells, pipeline/utility corridors, access roads, and central gathering facilities under Alternative A are summarized in Table 2.2.

***Table 2.2. Surface Disturbance Under the Proposed Action (Alternative A).**

Disturbance Source	Short-Term (2-3 years) Disturbance	Long-Term (10-20 years) Disturbance
Well Pads	0.6 ac	0.03 ac
Unimproved Two-Track Roads to be Used	8.34 ac	8.34 ac
All-weather roads to be used	5.1 ac	5.1 ac
Central Gathering Facilities	0.50 ac	0.50 ac
Pipeline/Utility Corridors	12.9 ac	0.0 ac
Existing Reservoir Improvement	0 ac	0 ac
TOTALSURFACE DISTURBANCE	27.44	13.97

*Short-term and long-term disturbances are not cumulative. Long-term disturbance estimates represent the total surface disturbance that would remain after successful reclamation has occurred. For example, construction of the 10 well pads will initially result in the surface disturbance of 0.5 acres/well pad, however, following well completion, each well pad will be reduced in size to 0.10 acre and the remaining 0.4 acres/well pad will be reclaimed.

2.2 ALTERNATIVE B – NO ACTION

Although Yates has a legal right to develop CBM minerals somewhere on their lease, analysis of the No Action Alternative is required by CEQ regulation. Under the No Action Alternative, current management plans would continue to guide management of the project area. No CBM well development, access road construction or pipeline construction would be implemented to accomplish project goals. Existing two-track roads within the project area would continue to be used for access by ranching, hunting and other land use activities. The No Action Alternative is illustrated in the attached map labeled Alternative B (see Appendix A).

2.3 COMPARISON OF ALTERNATIVES

Information in Table 2.4 is focused on activities and effects where different levels of effects can be distinguished quantitatively among alternatives.

***Table 2.3. Summary of Alternatives and Long-Term Surface Disturbances.**

Proposal Element	Alternative A Proposed Action	Alternative B No Action
CBM Wells	10 (0.03 ac)	0 (0 ac)
Access Roads Existing Two-Track Roads to be Used Proposed Two-Track Roads to be Used Existing All-Weather Roads to be Used	2.45 mi (4.75 ac) 1.74 mi (3.59 ac) 1.4 mi (5.1 ac)	0 mi (0 ac) 0 mi (0 ac) 0 mi (0 ac)
Central Gathering Facilities	2 (0.50 ac)	0 (0 ac)
Pipeline/Utility Corridors	6.65 mi (0 ac)	0 mi (0 ac)
Existing Reservoir Improvements	0	0
TOTAL <u>LONG-TERM</u> SURFACE DISTURBANCE	13.97 ac	0 ac

*Acreage calculations provided in parentheses represent new, long-term surface disturbance; that would occur with implementation of the proposed alternative. Disturbance calculations are not included for existing disturbances such as existing two-track roads and reservoirs.

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

A review of the comments and issues raised regarding this proposed action yielded the following alternatives:

- Directional and Horizontal Drilling
- Re-injection of Produced Water

No other alternatives were selected. The following discussion details the reasons that these two alternatives were not analyzed in detail.

2.4.1 Directional and Horizontal Drilling

Directional and horizontal drilling was eliminated from detailed analysis in this EA because of the shallow depth of the proposed wells. Horizontal drilling, by definition, is creating a horizontal or very highly deviated well bore, which requires a “bend” or curve to be drilled as the well bore transitions from vertical to horizontal. A horizontal well bore is also known as a directionally drilled well bore because it is drilled directionally (Eustes, 2003). As discussed under the Proposed Action, wells would be drilled to a depth of up to approximately 700 feet. This depth is too shallow to allow the efficient angling of pipe necessary for directional drilling.

Directional and horizontal drilling was also eliminated from detailed analysis due to the cost of drilling such a well. The cost of drilling wells could more than double development costs. A directionally drilled well requires specialized equipment and trained personnel to operate that equipment. Typical cost for this equipment and personnel can exceed \$10,000 per day (Eustes, 2003). Additionally, present drilling is done by water well type drilling rigs. These rigs cannot handle the specialized equipment required to drill a directional well. These wells require larger mud pumps and heavier pipe than a normally drilled well. Torque and drag would be higher, necessitating larger, more powerful motors. Therefore, a larger drilling rig (not truck mounted) would be necessary to drill directionally. Larger drilling rigs require larger pits, more equipment and larger drilling pads, thereby increasing the disturbed area at the drill site. Surface disturbance for a typical Vertical CBM well is approximately 0.33 acres. The typical surface disturbance for a horizontal CBM well would be 1.00 to 1.25 acres due to the size of the rig, support equipment, pit size, etc (Chase, 2003).

The sharp angle that would be required for the shallow coals likely would not allow for casing and the well bore could not be cased (Eustes, 2003). Therefore, the integrity of the well bore may not allow for directional drilling since the lower grade coals found in the Powder River Basin may not be competent enough to keep the well bore from collapsing in the horizontal portion of the hole. The common practice to drill and complete CBM wells in the Powder River Geologic Basin is to drill to the top of the coal seam and set 7-inch production casing. The well is then under-reamed to help prevent sloughing or caving of the coal into the well bore. A horizontal well would compound this sloughing/caving problem due to the large amount of coal exposed to the open well bore. If the coal sloughs or caves in the horizontal section, especially near the beginning of the horizontal section the benefit of drilling a horizontal or directionally drilled well would be lost.

As an example, Redstone (now Fidelity) attempted a directionally drilled well in the Montana part of the Powder River Geologic Basin and found they spent nearly \$0.9 million dollars for the well including the drilling and other costs required to bring the well into production. Although

they were able to run the pump through the radius of the curve, once the pump was placed it did not operate effectively in the horizontal part of the well. The pump was not able to efficiently separate the water and gas due to the space restrictions in the well. Most importantly, they found the well bore collapsed in the coal seam over time (Williams, 2003).

Powder River coals are characteristically water-rich, thereby requiring pumping of large volumes of water to the surface. Current applications of horizontal drilling in coal seams are in coals that do not require the movement of equivalent volumes of water. Currently submersible pumps are utilized to de-water the coal bed wells in the Powder River Geologic Basin. Despite efforts to develop high capacity down hole pumps, the industry has not been able to develop a pump that can operate in a horizontal well bore. One of the problems lies in the pumps being too long to fit through the medium radius (200-300 feet) or the tighter curved short radius (25-75 feet) well bore, provided these curves can be drilled in the Powder River Geologic Basin coals.

Submersible or down hole pumps are mechanically unreliable in that they are not able to tolerate being at angles of more than 30 degrees from vertical. This geometric/mechanical incompatibility requires operators to set the down hole pumps at or near the top of the curved section of a horizontal or directionally drilled hole. In a medium radius well bore the pump would have to be set about 200 feet vertically above the horizontal portion of the well. A pump set at that distance above the coal seam could be expected to leave a hydrostatic pressure of over 80 pounds on the coal reservoir, thereby reducing the recovery of coal gas. (Eustes, 2003)

Directional drilling is not practical in the Powder River Geologic Basin for the same reasons as horizontal drilling. Wyoming Oil and Gas Conservation Commission rules require the casing to be 60 feet or 10% of the well depth, whichever is greater (USDI BLM 2003 Vol 1. pg. 2-22). As an example, a coal seam at 1,000 feet requires a 100-foot surface conductor casing. If drilling to an 80-acre location from the center of a 160-acre location, a horizontal displacement of 933 feet must be achieved. The necessity of starting the curve of the horizontal displacement below the casing shoe of the conductor pipe would require the well bore inclination to be greater than 45 degrees from vertical, which brings the problem of the submersible pump placement into question again.

2.4.2 Re-injection of Produced Water

Re-injection of produced water was considered as an alternative to the proposed action. Under a re-injection alternative, Yates would capture and actively return produced water to aquifers. Methods for accomplishing return include storage and retrieval wells, infiltration pits, land application (for example, spreaders and sprinklers), infiltration at clinker zones and leach fields. It was eliminated from detailed analysis in this EA.

The technical and economic feasibility appears to be limited (USDI BLM 2003 Vol 1 pg 2-65 through 2-67). The Powder River Basin EIS describes the technical feasibility as follows: "The nature of groundwater flow systems and water chemistry in the PRB are not well understood, making it difficult to analyze the potential effects of widespread injection. Formations that are potential zones for injection may have limited capacity to accept the large volumes of water that would be injected. Existing groundwater in some potential zones for injection likely is unsuitable for mixing with water produced from CBM wells, if future retrieval of injected water for beneficial use is planned. Injection into some formations would degrade the quality of the water produced from CBM wells." Investigations performed by injecting produced water from the Anderson/Canyon Coal into another aquifer revealed that the receiving aquifer must be at least

partially depleted to avoid over-pressuring that receiving aquifer (USDI BLM 2003, Vol 1 pg 3-54 through 3-55). Over-pressuring an aquifer can result in fracturing the rock causing earthquakes (USDI BLM 2003, Vol 1 pg-3-71).

The Powder River Basin EIS further details, “The economic feasibility of an all injection alternative is unproven. To date, injection has been tested, but has not been shown to be economically viable in the PRB because of its high cost and uncertain success in disposing of all produced water over the life of a group of CBM wells. The high costs associated with injection would not be reasonable unless disposal of water by this method would be successful and the costs of this method would not cause development of CBM to become uneconomical. Development of CBM using injection as the only water handling method would eliminate the current beneficial use of water discharged from CBM wells, further reducing the economic feasibility of this alternative.”(USDI BLM 2003 Vol 1 pg 2-65 through 2-67)

Additional reasons for eliminating this alternative from detailed study include: Though this action would mitigate potential surface water impacts, it would create additional potential groundwater impacts. Injection into the coal seam would defeat the purpose of removing water from the coal seam to produce methane. Also, injection would require a system of wells and pipelines that would increase the total surface disturbance. Finally, because the produced water is suitable for livestock, wildlife, and possibly irrigation, surface discharge would make it available for subsequent beneficial uses as needed.

2.5 IMPACT AVOIDANCE AND MITIGATION MEASURES

In response to public comments on this proposal and FS Resource Specialist recommendations, impact avoidance and mitigation measures were developed to reduce potential adverse impacts of the Proposed Action alternative. The measures described below are consistent with those measures required in the 2002 Grassland Plan (USDA FS 2002b) and provided in the Powder River Basin EIS Record of Decision and Resource Management Plan Amendments (USDI BLM 2003, pages A-5 through A-18). Other mitigation measures available for review are in the Powder River Basin EIS, pages 4-392 through 4-405. They will be site specifically implemented either as APD requirements or as Conditions of Approval attached to and made part of the APD.

Geology and Minerals

- Methane gas migration shall be mitigated by well control, casing, ventilation, and plugging procedures.

Surface Water

Mitigation measures in the form of water management plans have been developed for the POD (Gene R. George & Associates, 2002 and 2004) and shall be applied as a cooperative effort at the time the Permit to Drill is issued. This implementation shall include the agencies with jurisdiction. The agencies include FS, BLM, US Army Corps of Engineers, Wyoming State Engineers Office, Wyoming Oil and Gas Conservation Commission, and/or Wyoming Department of Environmental Quality, in consultation with the involved local land managers and soil conservation districts. Yates, local landowners, and nearby downstream interests, including users of waters and landowners affected by impacts of increased flows on access, ranching, or mining operations shall participate. The cooperative effort of all stakeholders was necessary in

developing the water management plans that identify mitigating measures for areas or drainages where high CBM generated flows are or could be impacting existing uses. Some of the measures that can be applied at each site include:

- The transport of produced water to distant discharge points, requiring the use of water pipelines.
- Produced water shall be discharged into existing stream channels and reservoirs in a manner that shall not cause increased or accelerated erosion. Energy dissipation shall be achieved through the use of rock, placement of concrete control structures and/or the establishment of hydrophytic vegetation. Discharge points shall be located to minimize spring flooding of fields.
- Discharges shall be limited to amounts less than or equal to the naturally occurring mean annual peak flow which can be handled by the natural channel under anticipated conditions.
- Discharge into playas is not permitted.
- Discharge points shall be located in stable channel locations or in reservoirs away from any significant downstream head cuts or to other major erosional features, outfall design may include discharge aprons and downstream stabilization of channel side slopes to prevent erosion and provide energy dissipation. Monitoring of the outfalls will be conducted, and if erosion occurs, remediation will be done. Head cuts that are found to be moving one foot or more per year will be remedied. The mitigation action plan will be developed with and approved by the USDA FS.
- Discharge facilities shall be designed site-specifically using best management practices, to accommodate livestock access to water, to control erosion, and to limit sedimentation. If any down cutting or head cutting is occurring due to CBM flows, the landowner will be informed of the problem. If agreeable to the landowner, erosion control measures for advancing head cuts will include sloping of the head cut and lining the channel with erosion control geotextile matting. Repair and erosion control measures for down cut channels will include backfill of the eroded area with topsoil, seeding with native grasses, and construction of water bars at least every 50 feet over the affected area.
- Downstream impoundments may need new or redesigned outlet works in order to handle the steady inflow provided by CBM discharge water.
- If necessary, additional low water crossings and culverts shall be installed at downstream locations as well as possible erosion control measures as stated in the water management plans.
- Timely re-contouring and revegetation of disturbed areas shall be required to limit runoff that could cause sediment concentrations in surface waters to rise over present levels.

Groundwater

- Standard water well agreements shall be consummated between Yates and the FS, and may be negotiated between Yates and adjacent project area private landowners, to

mitigate water well impacts that may be caused by Yates's CBM operations in the project area.

Air Quality

- As needed or required by the FS, Yates shall apply road dust mitigation during construction and operation phases in order to minimize fugitive dust emissions. Such mitigation may include measures shown in Table 4-98 of the PRB FEIS, p. 4-405 (USDI, BLM, 2003).

Soils

- Accelerated soil loss shall be minimized by limiting the following: the removal of vegetation; the leveling of work areas; and the location of wells on slopes that require cuts-and-fills for well pad construction.
- Timely initiation of reclamation and revegetation efforts shall be required to effectively and immediately control accelerated soil loss due to either wind or water erosion.
- Road construction that requires cuts-and-fills shall be minimized. Pipeline construction also shall avoid steeper slopes where possible. Where necessary, erosion control features, such as water bars or other means of diverting flows off sloping pipeline rights-of way, shall be constructed to control increased runoff and erosion.
- Areas of highly erosive soils shall be avoided when drill sites, two-track routes, and pipeline routes are surveyed and staked, in order to substantially reduce the amount of soil loss.

Reclamation

- The extent of surface disturbance and the length of time that the area shall remain disturbed before interim or final reclamation activities commence shall be minimized. Interim and final reclamation of all disturbed areas shall proceed in a timely manner. Reclamation activities shall be conducted during time frames established by federal land management agencies, landowners and affected issues.
- Reclamation must produce a natural appearance and must be consistent with site conditions, area management standards, and projected uses, as agreed upon by Yates, the FS, and other federal agencies.
- Reclamation shall include, as appropriate, re-contouring, establishment of desirable, perennial vegetation, stabilization and erosion control of all disturbed areas. Additional measures, such as topsoil conservation, temporary fencing, mulching, or weed control shall be used, as appropriate, to ensure long-term vegetative stabilization of all disturbed areas.

Vegetation Resources

- Reclamation and final closure of the proposed operations shall re-establish vegetation suitable for forage and wildlife habitat in the disturbance areas.

- Yates shall implement actions that will enhance restoration of vegetation by desirable species including the following site preparation and reclamation techniques: mechanical loosening or roughening of the soil where compacted (disking and ripping); fertilization or soil amendment; seeding to proper depth with desirable species; mulching to retain soil moisture; transplanting containerized plants to speed the establishment of slow-growing species; control of noxious weeds; or temporary fencing to exclude livestock until vegetation is re-established successfully. These vegetation restoration techniques shall be used, as appropriate.
- Mitigation activities most effective in reducing the potential for decreased vegetation production include timely and well-planned reclamation and effective noxious weed management, avoidance of disturbance within playas, and avoidance of discharge within closed basins, playas, and areas with soils that would be difficult to re-vegetate. These impact avoidance and mitigation measures shall be used, as appropriate.

Wildlife Resources

- To reduce the risk of nest failure, construction activities (drilling, testing, new construction, workovers) shall not be conducted within the line-of-sight, up to 0.5 mile, of intact raptor nests during the breeding season (1 February through 31 July for golden eagles, 1 March through 31 July for Swainson's hawks and Ferruginous hawks, 1 April through 15 August for merlins), and within 0.125 mile of active nests of other raptors (e.g., northern harrier [*Circus cyaneus*], short-eared owl [*Asio flammeus*], American kestrel [*Falco sparverius*], etc.). This stipulation may be waived by the FS if a nest is documented to be inactive for a consecutive period of seven years.
- To protect the integrity of raptor nesting sites, surface occupancy shall be prohibited within 0.25 mile of intact nests of golden eagles, merlins (*Falco columbarius*), ferruginous hawks, Swainson's hawks, and burrowing owls. This stipulation may be waived by the FS if a nest is documented to be inactive for a consecutive period of seven years.
- Roads shall be established as needed to accomplish the purpose and need for the project while minimizing disturbance of soil and vegetation, as well as the potential for wildlife-vehicle collisions.
- Any trees found within the project area shall be left undisturbed by surface disturbance activities.

Visual Resources

- Gathering lines, water lines, high pressure lines and underground electrical cables shall be located along roads rights-of-way whenever feasible.
- Adverse visual impacts shall be minimized through careful location of facilities, minimal disturbance of affected sites, and design of facilities so that they harmonize with the surrounding landscape.
- Construction debris shall be removed immediately, as it creates undesirable textured contrasts with the landscape.

- Resource protection measures proposed for erosion control, road construction, rehabilitation and revegetation, and wildlife protection shall be implemented during the approval of APDs and Sundry Notices. Those measures shall mitigate impacts to visual quality.

Cultural Resources

- In the event that cultural resource deposits are uncovered and identified during project construction, and subject to stipulations contained in and rights granted by lease terms, construction shall be halted and a FS or FS-approved archaeologist will evaluate the site including site excavation as needed for the purpose of gathering available significant information.

Paleontological Resources

- A FS-approved paleontologist has completed a vertebrate fossil survey and issued a survey report, available for review at the Douglas FS office. No fossil remains were discovered at any of the sites slated for construction during the survey. In the event that significant fossil remains are identified during project construction, and subject to stipulation contained in and rights granted by lease terms, construction at that location shall be halted and shall not resume until the significant resource is unearthed and recovered, or the paleontologist has determined that the remains are not significant.

Land Use and Transportation

- As needed or required by the FS, roads to plugged and abandoned wells shall be decommissioned and reclaimed.
- Where feasible, access road shall be constructed in a transportation corridor that would also include gas and water pipelines, and electrical cables.

Hazardous Waste Management

- Hazardous substance, as defined by Comprehensive Environmental Response Liability Act (CERCLA), will not be used in the construction or drilling operations associated with these wells. Commercial preparations, which may contain hazardous substances, may be used in production operations and will be transported within the project area. Any materials containing hazardous substances will be handled in an appropriate manner to minimize the potential for leaks and spills to the environment. Resource Conservation and Recovery Act (RCRA) hazardous wastes will not be generated by well-drilling operations. Exempt working pit contents will be buried onsite.
- Spills of oil, gas or any other potentially hazardous substance will be reported immediately to the Forest Service, BLM and other responsible parties, and will be mitigated immediately, as appropriate, through cleanup or removal to an approved disposal site.

2.6 MONITORING

Surface Water

- Water volume and water quality parameters shall be monitored by Yates at discharge points consistent with State of Wyoming Department of Environmental Quality requirements for effluent limitations, monitoring requirements contained in any applicable permits, and FS monitoring requirements contained in any applicable monitoring plans.
- Yates shall monitor the occurrence of erosion from water discharge on an annual basis. During the late summer each year, a visual inspection will be made of the water discharge channels on FS lands in section 7 and head cutting or down cutting noted and reported to the FS.

Groundwater

- Yates shall monitor water wells where water well agreements exist between Yates and the FS, and/or as negotiated with adjacent private land owners to document the impacts of Yates's operations on those water wells and to determine the effectiveness of water well impact mitigation measures.

Wildlife

- Annual monitoring of raptor nest sites within the project area shall be completed by a qualified wildlife biologist (and funded by Yates) during the 10 – 20 year life of the project.
- Annual surveys for greater sage grouse leks shall be completed by a qualified wildlife biologist (and funded by Yates) during the 10-20 year life of the project.
- Observations of mortality of any wildlife species or establishment of new nests within the project area shall be reported to the Douglas Ranger District annually.

Vegetation

- Weed monitoring and weed control measures shall be conducted annually for the 10 to 20 year life of the project.

3.0 GRASSLAND PLAN CONSISTENCY AND COMPLIANCE

3.1 Grassland Plan Consistency and Compliance

The analyses documented in this EA are tiered to the *Final Environmental Impact Statement for the Northern Great Plains Management Plans Revisions and Record of Decision* (USDA FS 2002a) and the Grassland Plan (USDA FS 2002b). The Grassland Plan has replaced the 1985 *Medicine Bow National Forest Land and Resource Management Plan* as it relates to the Thunder Basin National Grassland. The Grassland Plan establishes the management direction for the grassland for the next 15 years, and offers guidance for the implementation of all resource management activities on the Thunder Basin National Grassland. Information about the analysis and project area described in the Grassland Plan are contained in or referenced in this document. The Grassland Plan includes grassland-wide and site-specific standards and guidelines that can assist the land manager to achieve the goals and objectives, and desired conditions on the grassland that are consistent with the Plan. The Thunder Basin project area of the Thunder Basin National Grassland contains lands that will be managed under a single Grassland Plan management area prescription (page 3-26 USFS 2002b)

The factors that were considered in determining whether or not the proposed coal bed methane well field development and the alternatives actions analyzed in detail are consistent with the standards and guidelines described in the Grassland Plan include:

The Purpose and Need for the project;

The Grassland Plan Management Area Prescription(s) and Management Emphasis Theme(s) relevant to the Project Area;

The current conditions in the proposed project area compared to the desired conditions for minerals development and other resources protection and enhancement, as described in the Grassland Plan;

The necessity to continue the development of mineral resources in an area where significant resource potential exists, where progress toward that goal has already been made, and where the Grassland Plan goal is to encourage and allow this development to occur;

Whether or not the action could meet intended Management Area Prescription goals and objectives for providing energy to the nation that is needed, while at the same time meeting the goals for the protection of wildlife and threatened, endangered and sensitive plant and/or animal species habitats, and rangeland uses and other resource needs.

The IDT, District Ranger and Forest Supervisor have determined that Alternative A is consistent and would be in compliance with the Grassland Plan. Alternative B is not consistent with the Grassland plan because it does not honor valid existing operating rights associated with the leases.

The Record of Decision for the 2002 Thunder Basin National Grassland Land and Resource Management Plan acknowledges on pages 18 and 43 the existing lease rights held by Yates Petroleum Corporation. Grassland Plan standards and guidelines would not apply to the Yates leases if they would be inconsistent with the rights granted under those leases, because they were issued before the date of the decision that implements the current plan.

3.1.1 Management Area Prescription 8.4

A Management Area (MA) is defined as an area that is managed for a particular emphasis or Theme. Each management area has a prescription that describes the management Theme, the Desired Conditions, and the Standards and Guidelines that apply to it (in addition to the grassland-wide standards and guidelines). The Management Area Prescription for the Thunder Basin area is 8.4, Mineral Production and Development (USDA FS 2002b pg 3-25). Management Area Prescription (MAP) 8.4, the desired conditions for MAP 8.4, and the standards, guidelines, and oil and gas stipulations used to achieve and maintain the desired conditions, are described below in the context of how they apply to Yates's proposed project.

MAP 8.4 Theme

The Grassland Plan describes the Theme for MAP 8.4 as "...managed for solid mineral operations".

Desired Condition

Desired Condition describes what the reader should ideally be able to observe within a given area of the National Grassland. Desired condition can be one in the same as the existing condition, but sometimes is not. A description of whether or not the resource-specific existing condition meets the desired condition is provided in Chapter 4.0, where appropriate. Conceptually, the desired condition is a goal towards which the FS works to achieve and/or maintain such condition in a management area. When reviewing a proposed project on NFS land, the Decision Maker takes into consideration whether the proposed project will result in a move toward the desired condition, a move away from the desired condition, or would have no effect on the desired condition. The Environmental Consequences chapter (Chapter 4.0) of this EA discloses such determination(s) for resources analyzed and possible effects, where appropriate.

The implementation of actions planned for the purpose of achieving desired conditions in the project area are subject to the rights granted by and stipulations and other lease terms contained in the leases held by Yates Petroleum Corporation that were issued prior to the implementation of the Grassland Plan 2002. A review and analysis of Grassland Plan Desired Conditions and applicable lease stipulations has disclosed that all of the desired conditions for Management Area Prescription 8.4 are consistent with and accommodate the stipulations contained in leases issued prior to the July 31, 2002 Regional Forester decision that implements the Grassland Plan.

Management Area 8.4 (USDA FS 2002b pg 3-21)

This management area will display mineral operations of all types, especially coal, coalbed methane, oil, and gas. Mineral operations are emphasized to effectively and efficiently remove available commercial mineral resources, concurrent with other ongoing resource uses and activities. Operations include development and production of solid and fluid mineral values with the associated ancillary facilities. Facilities and landscape modification are visible but are reasonably mitigated to blend and harmonize with natural features. Reclamation activities restore the area to a reasonable level of pre-development condition.

Restrictions on public use occur to ensure safety and to avoid unreasonable interference with mineral and production operations. Visitors can experience frequent encounters with people, heavy equipment, and noise.

Hilighit Bill Geographic Area Direction (USDA FS 2002b pg 2-21)

Minerals exploration and development and livestock grazing will be significant management activities in this geographic area. In some areas, there may be restrictions on public use to ensure public safety and to avoid unreasonable interference with mineral operations. In those areas where mining is emphasized, reclamation activities will restore the area to a reasonable level of its pre-mining condition. In areas with other management emphases, existing vegetative diversity and structural conditions will be maintained and enhanced. This area will have a healthy and diverse mix of grasses, including the following species: western wheatgrass, needle and thread grass, green needlegrass, little bluestem, blue grama, and prairie junegrass.

The streams and riparian areas will be in proper functioning condition or moving towards proper functioning condition. Riparian areas/woody draws will be managed to maintain or enhance different age classes of herbaceous plants, shrubs, and trees. Desired riparian species include sedges, rushes, snowberry, rose, willow, cottonwood, as well as other woody plants. Soils in this geographic area will have high infiltration rates and low soil compaction, resulting in minimal overland flow events.

There will be more development and a moderate number of facilities in this geographic area. Facilities and landscape modifications will be visible but reasonably mitigated to blend with natural features. Higher fence densities and intensive mineral development may occur.

Mineral developments and facilities such as coal mines, railroads, oil and gas wells, and pipelines will be present and will often dominate the landscape. When mineral activities are concluded, the disturbed lands will be reclaimed to blend in with adjacent undisturbed areas.

4.0 ENVIRONMENTAL CONSEQUENCES

This section summarizes the physical, biological, social, and economic environments of the affected project area and the potential changes to those environments due to the implementation of the alternatives.

4.1 GEOLOGY AND MINERALS

The project area is located along the eastern limb of the Powder River structural basin. The portion of the Powder River Geologic Basin situated within Campbell County, such as the Thunder Basin area, is one of the major mineral development areas in North America. Coal, oil and gas, and uranium have been the principal resources extracted from the basin.

Geologic formations exposed in the Thunder Basin project area are Quaternary alluvial deposits and the Wasatch Formation (WGS 1987 and 1990). Unconsolidated and poorly consolidated Quaternary alluvial deposits have been accumulating since the Pleistocene Epoch (Ice Age). They are found in the floodplains and low terraces of the larger streams draining the project area. These deposits are comprised of silt to gravel sized material that has been eroded from siltstone, conglomerate, and clinker within the Powder River Geologic Basin. The Wasatch Formation is composed of interbedded arkosic sandstone, siltstone, shale, and conglomerate lenses, and also contains many coals in the lower part (WGS 1990). It dates back from the Eocene epoch of the Tertiary period (37 to 58 million years ago). This formation occurs at the surface throughout the Thunder Basin area.

The Wyodak coal seam usually is between 60 and 70 feet thick and has a maximum thickness of 100 feet. Within the Thunder Basin area, this seam occurs at depths of approximately 300 to 1,000 feet below the surface. South of Gillette, where the Thunder Basin area is located, the Wyodak coal seam separates into the Anderson and Canyon coal beds (USGS 1986).

A detailed description of the geologic and mineral resources of the Powder River Geologic Basin (including the Thunder Basin project area) is included in the Final Environmental Impact Statement for the Powder River Oil and Gas Project (USDI BLM 2003, Vol 1 pg 3-56—3-77).

4.1.1 ALTERNATIVE A – PROPOSED ACTION

Direct and Indirect Effects: Methane is produced from CBM wells drilled into underlying coal seams in the Powder River Geologic Basin. Peak gas production for the 10 proposed CBM wells could average 1.25 million cubic feet per day (mmcf/day) based on an estimated average production rate over the life of a well 125 thousand cubic feet per day (mcf/day) per well (USDI BLM 1999). Initial production rates are expected to exceed this average during the first few years of production, then steadily decline during the well's economic life.

The Proposed Action would result in a move toward a condition that would be in compliance with the desired conditions for minerals development, as discussed in Chapter 3.0.

Cumulative Effects: Partial dewatering of the Wyodak coal seam has occurred in the Powder River Geologic Basin during coal mining and would continue as mining and CBM development proceed, possibly enhancing the potential for methane migration to occur within the project area and greater cumulative impact assessment area of the Powder River Geologic Basin.

Experience from coal mining has shown that methane seeps involving potentially explosive concentrations of methane can occur in the vicinity of near-surface coal seams (Glass et. al 1987 Pages 1, 6 and 7).

As described in Final Environmental Impact Statement for the Powder River Oil and Gas Project (USDI BLM 2003 Vol. 1 pg 3-73 through 3-75), methane migration potentially could occur over short or long distances within the Powder River Basin Geologic Basin, along naturally occurring joints and fractures. Methane could emerge from water wells near CBM production areas, affecting water wells, residences, or coal mine facilities. The development of the 10 proposed Thunder Basin wells would contribute to the overall dewatering of the Wyodak coal seam and increase the potential for methane migration. The effects of this project's 10 wells does not result in a significant incremental impact to the on going and projected cumulative effects coming from existing coal mines, CBM wells, and reasonably foreseeable developments.

The escape of methane also can result from inadequate well control procedures or faulty well casing or plugging. In the case of the Proposed Action, methane migration would be controlled through strict APD conditions of approval that address well control, casing, ventilation, and plugging procedures appropriate to the Thunder Basin project area.

4.1.2 ALTERNATIVE B – NO ACTION

Direct, Indirect and Cumulative Effects: Under the No Action Alternative, the 10 proposed wells would not be constructed. Therefore, production under this alternative would not occur on federal lands and the No Action Alternative would not result in a move toward the desired conditions for minerals development.

Wells on adjacent private and State lands designed to drain the target formations have been permitted and many of them have been drilled and contribute to the potential for impacts from methane migration in the analysis area (see Appendix A Project Analysis Area Project Map). Potential direct, indirect and cumulative effects of drainage and methane migration resulting from implementation of the No Action Alternative would therefore, be similar to those discussed under the Proposed Action.

4.2 CLIMATE

Regional climatic conditions for the project area can be classified as semi-arid. Climatic data measured at Reno Junction, located a few miles from the project area, are available for 1963 - 1983. The data are summarized in Table 4.1. The recorded annual average precipitation for the area is 11 inches. On average, over 60 percent of the annual precipitation falls between April and July while only 12 percent of the precipitation occurs between November and February. The average annual temperature is approximately 44 degrees F. July is typically the warmest month with an average temperature of 85 degrees F. January is typically the coldest month with an average temperature of 32 degrees F. Recorded temperature extremes range from -34 degrees F (December 1968) to 103 degrees F (August 1965).

Wind velocities are a controlling factor in the dispersion of air pollutants. Wind data for the Hampshire Energy project were provided by the Air Quality Division of the Wyoming Department of Environmental Quality (WDEQ). Figure 4-1 presents a wind rose of the Hampshire data. As

shown, winds typically blow from the northwest and the southeast. The average annual wind speed is approximately 15 miles per hour (6.78 meters per second).

Table 4.1 Climatic Conditions Recorded at Reno, WY 1963-1983*

Climatic Condition	Measurement
Annual Mean Temperature	44.2 degrees F
Annual Maximum Temperature	56.9 degrees F
Annual Minimum Temperature	31.2 degrees F
Recorded Maximum Temperature	103 degrees F
Recorded Minimum Temperature	-34 degrees F
Annual Average Precipitation	11.01 inches
Annual Average Snowfall	22.4 inches

* High Plains Regional Climate Center, undated.

As the alternatives would not have a direct, indirect or cumulative effect on climate, the resource is not discussed further in this document.

4.3 AIR QUALITY

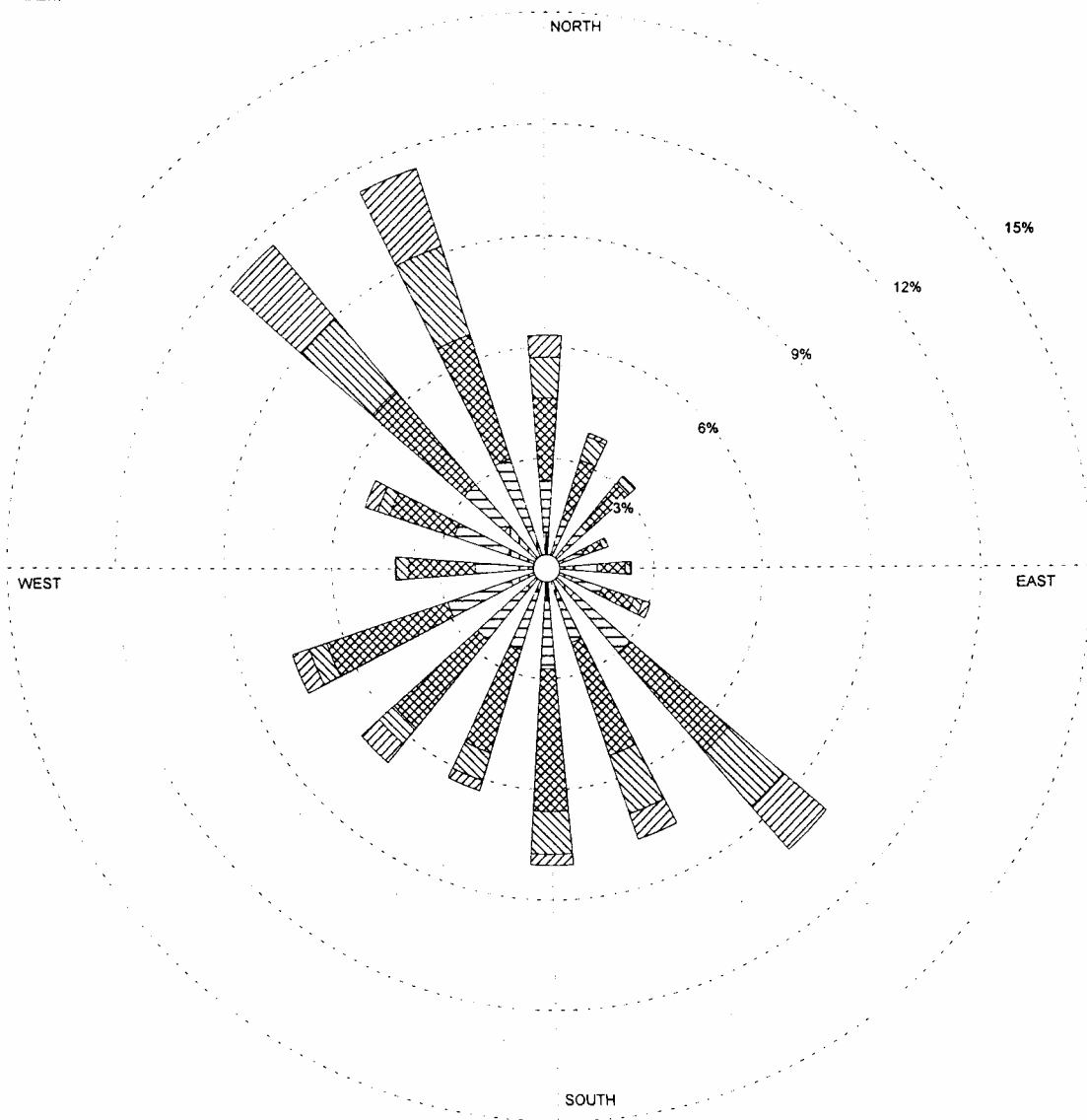
Air quality in Campbell County, Wyoming is designated attainment with EPA's National Ambient Air Quality Standards (NAAQS.) Site-specific air quality monitoring data are not available for the project area, however regional air quality data (Table 4.2) is representative of project area conditions.

Table 4.2 Ambient Criteria Pollutant Concentrations

Pollutant	Averaging Period	Background Concentration ($\mu\text{g}/\text{m}^3$)	National Ambient Air Quality Standard ($\mu\text{g}/\text{m}^3$)
NO ₂	Annual	16.5	100
CO	1 - hour	3,500	40,000
	8 - hour	1,500	10,000
PM ₁₀	24-hour	42	150
	Annual	17	50
PM _{2.5}	24-hour	19	65
	Annual	7.6	15

Source: Powder River Basin FEIS (2003), Table 3-93, p. 3-294.

WIND ROSE PLOT
Hampshire Energy



<p>Wind Speed (m/s)</p> <p>> 11.06</p> <p>8.49 - 11.06</p> <p>5.40 - 8.49</p> <p>3.34 - 5.40</p> <p>1.80 - 3.34</p> <p>0.51 - 1.80</p>	<p>DISPLAY</p> <p>Wind Speed</p> <p>AVG. WIND SPEED</p> <p>6.78 m/s</p> <p>ORIENTATION</p> <p>Direction (blowing from)</p>	<p>UNIT</p> <p>m/s</p> <p>CALM WINDS</p> <p>0.11%</p> <p>1981</p> <p>Jan 1 - Dec 31</p> <p>Midnight - 11 PM</p>	
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Figure 4-1. Wind Rose near Thunder Basin Project Area.

In the vicinity of the project area, the primary sources of air pollutant emissions include surface coal mines, electrical power generating plants, various sources associated with oil and gas production including CBM compressors, fugitive dust from roadways, and natural wind blown dust. The primary pollutants of concern associated with these existing sources are oxides of nitrogen (NO_x), carbon monoxide (CO), sulfur dioxide (SO₂), and particulate matter with an aerodynamic diameter less than 10 microns (PM₁₀) and 2.5 microns (PM_{2.5}). The combustion of fossil fuels is the primary source of NO_x, CO and SO₂ emissions. Surface mining operations, vehicle traffic and wind erosion contribute to particulate emissions.

4.3.1 ALTERNATIVE A - PROPOSED ACTION

Direct and Indirect Effects:

Compressors:

Compressors contribute the majority of regulated air pollution emission associated with CBM development projects. Under the Proposed Action, one new natural gas engine driven gas compression unit would be required. This compressor was analyzed in the Powder River Basin EIS analysis. Transportation of the gas produced from this project would be accomplished through the use of existing or proposed compression resources previously analyzed in the Powder River Basin EIS (USDI BLM 2003). The ten proposed wells would be served by existing compressors, and one additional compressor, all located on private land in the analysis area. Thus, the Proposed Action would not generate any additional NO_x or CO emissions from compressor operations above the levels previously analyzed. (The *“Technical Support Document, Air Quality Impact Assessment for the Montana Final Statewide Oil and Gas EIS and Proposed Amendment of the Powder River and Billings Resource Management Plans and the Wyoming Final EIS and Planning Amendment for the Powder River Basin Oil and Gas Development Project.”* (USDI BLM 2003) analyses emissions for the entire PRB development scenario, up to 39,367 wells and associated ancillaries, (USDI, BLM, 2003).

Because emission levels are below the “major source” thresholds, these compressor units are considered minor sources under the Clean Air Act. Compressors are currently regulated by the WDEQ’s minor source program and subject to minor source Best Available Control Technology (BACT). It should be noted that the PRB EIS (page 4-381) estimated compressor emission rates at 1.0 grams of NO_x per horsepower-hour. As of the writing of this document, BACT for these types of compressors in the State of Wyoming is typically 0.7 grams of NO_x per horsepower-hour. As a result, the emissions modeled in the PRB analysis were conservative,. (USDI BLM 2003) (See also, the *Powder River Basin FEIS*, pages 4-377 through 4-392 for modeling results of cumulative impacts from various sources of air pollution including compressors associated with this and other projects.) (USDI BLM 2003).

NO_x emissions for 1,000 hp (maximum power estimated by Yates for this POD) would be 6.17 tons/year utilizing the emission rate noted above for an 8,000 hour operating year.

Generators:

Temporary natural-gas fired generator sets would be utilized for some time frame to produce electricity for the POD. The maximum power required (as estimated by Yates) would be 40 kW of generation. This equates to approximately 55 hp, and using the 1.0 grams of NO_x per

horsepower-hour noted in the PRB EIS for these smaller engines, NOx emissions for generators would be approximately 0.49 tons/year.

Fugitive Emissions from Wells:

Emissions occurring from each CBM well would be temporary (i.e., occurring on limited occasions during a 12-day construction period) and would occur in isolation, without significantly interacting with adjacent well locations. Fugitive air pollution emissions from CBM wells are not subject to WDEQ's minor source program. No flaring of CBM wells occurs during flow testing, so no emissions would occur due to flaring.

Fugitive Dust:

Vehicle traffic and associated emissions would increase slightly as a result of the Proposed Action. Emissions associated with vehicle traffic would include fugitive particulate emissions as a result of travel on unpaved roads. The level of vehicle traffic associated with the development of 10 wells under the Proposed Action is considered minimal when compared to the vehicle traffic analyzed for 17,754 miles of improved and two-track roads in the programmatic PRB FEIS (page 2-18) (USDI BLM 2003).

Fugitive dust emissions from vehicles on unpaved roads are calculated from the following formula Final Environmental Impact Statement for the Powder River Basin Oil and Gas Project (USDI BLM 2003, Appendix F, page F11; AP-42, Section 3.13.2):

$$\left(E \left[\frac{lb}{VMT} \right] \right) = 5.9 \times k \times \left(\frac{s}{12} \right) \times \left(\frac{S}{30} \right) \times \left(\frac{W}{3} \right)^{0.7} \times \left(\frac{w}{4} \right)^{0.5} \times \left(\frac{365 - p}{365} \right)$$

Where:

VMT = Vehicle mile traveled; highest use estimated as 280 per day

k = particle size multiplier; 0.36 for PM₁₀ and 0.095 for PM_{2.5}

s = road silt content; 12 percent for a rural dirt road

S = average vehicle speed; 40 mph

W = vehicle weight; 3 tons for project vehicles

w = number of wheels; 4 wheels for project vehicles

p = number of days with more than 0.01 inches of precipitation; 100 for the expanded project area

- (Vehicle miles traveled would be greatest during the 1-2 month long construction period; therefore vehicle miles traveled will be estimated for the highest expected use. Actual vehicle miles traveled would likely be much lower during the operation period. Assuming all 5.59 miles of road (existing and new) as proposed in Alternative A are traveled each day, and a typical day of construction activity involves 5 round trips by 5 vehicles over the entire 5.59 mile road network, 5 x 5 x 5.59 x 2 = 280 VMT/day.)

Therefore, the expected fugitive PM emission factor would be 2.60 lbs/ VMT. The daily traffic during the construction phase is estimated as 280 miles per day on unpaved roads within the project area. Therefore, the estimated average daily PM₁₀ plus PM_{2.5} emissions from vehicles during the construction phase would be 728 lbs or 0.36 tons. These emissions would occur throughout the project area. Watering of roads would be required during the construction phase. Based on information in AP-42 Final Environmental Impact Statement for the Powder

River Basin Oil and Gas Project (USDI BLM 2003, Appendix F, page F11; AP-42, Section 3.13.2), we could expect approximately 70% control efficiency by watering of roads. After considering the emissions reductions achieved by watering roads, the expected fugitive PM emission would be approximately 0.11 tons of combined PM₁₀ and PM_{2.5} per day. Assuming 60 days of construction, the total PM emissions from this phase of operation would be 6.5 tons. These emissions estimates represent highest expected road use days. Actual vehicle miles traveled per day are likely to be less than those estimated here, especially after the 1-2 month long construction phase is completed. Additionally the speed limit on unpaved roads will likely be less than the assumed 40 mph, further reducing actual dust emissions. For comparison, the Air Quality Technical Support Document for the PRB FEIS (page 4-41) (USDI BLM 2003) (Argonne 2002) estimated a maximum of 9.9 tons of combined PM₁₀ and PM_{2.5} emissions per day for the entire PRB project during the highest activity year (2007). Any dust generated by vehicles at a given location would be localized and short-term.

The construction phase of the project is expected to occur during 60 days of on-site work over a twelve (12) month period. Construction is not expected to occur simultaneously in the surrounding area as CBM well construction within 1-2 miles of this proposed project has already been completed. Road use following the construction phase would be limited to the occasional recreation user and periodic maintenance activities. During the operation phase, a pick-up truck would travel approximately 1.25 miles of unpaved road to collect information stored in a central gathering facility once a week. Any dust generated by vehicles at a given location would be localized and short-term.

Watering or other dust control techniques would reduce fugitive dust emissions from traffic on un-paved roads. Watering of access roads would occur as needed or required by the Forest Service both during the construction and operation phases of the project. Imposing reduced speed limits on unpaved roads would also decrease fugitive dust emissions from vehicle traffic.

Fugitive dust emissions would also occur from wind blown erosion, however, these impacts would be negligible. Fugitive dust emissions would also occur from construction processes. Cumulative effects of fugitive dust emissions are considered in the model described in the Powder River Basin FEIS (pages 4-377 through 4-392; and Appendix F.) (USDI BLM 2003)

Vehicle Exhaust:

The EPA through the implementation of standards for new vehicles regulates vehicle exhaust emissions. States may also impose vehicle emissions testing programs for vehicles registered in their state. Vehicle traffic and associated emissions would increase slightly as a result of the Proposed Action. Emissions associated with vehicle traffic would include NO_x and CO emissions from vehicle tailpipes. Diesel fueled vehicles may also emit SO_x. These emissions are expected to be so small that the impact is not quantifiable.

Vehicle exhaust emissions can be estimated for NO_x using the equation:

$$E = \frac{\left(1.5 \frac{gm}{mile}\right) \times \left(VMT \frac{miles}{day}\right)}{\left(454 \frac{gm}{lb}\right)}$$

Where:

E = NO_x emissions in lbs/day

VMT= vehicle miles traveled; highest use estimated at 280 / day

- (Vehicle miles traveled would be greatest during the 1-2 month long construction period; therefore vehicle miles traveled will be estimated for the highest expected use. Actual vehicle miles traveled would likely be much lower during the operation period. Assuming all 5.59 miles of road (existing and new) as proposed in alternative A are traveled each day, and a typical day of construction activity involves 5 round trips by 5 vehicles over the entire 5.59 mile road network, $5 \times 5 \times 5.59 \times 2 = 280$ VMT/day.
- The NO_x emission factor of 1.5 gm NO_x per vehicle mile for project vehicles is taken from Final Environmental Impact Statement for the Powder River Oil and Gas Project (USDI BLM 2003, AP-42, Volume II, Table I.18)

Calculation of the emissions using an EPA methodology and a NO_x emission factor of 1.5 gm NO_x per vehicle mile results in an estimated 0.93 lbs. of NO_x produced per day, or about 0.0005 tons per day. These emissions would be distributed over the project area. These emissions estimates represent highest expected road use days. Actual vehicle miles traveled per day are likely to be less than those estimated here, especially after the 1-2 month long construction phase is completed. For comparison, the Air Quality Technical Support Document for the PRB FEIS (page 4-41) (Argonne 2002) estimated 40.44 tons of NO_x emissions per day for the entire PRB project.

Exhaust emissions from drill rigs and other construction equipment would be short term and localized. These emissions are not regulated other than by methods previously described above.

The level of vehicle traffic associated with the development of 10 wells under the Proposed Action is considered minimal when compared to the vehicle traffic analyzed for 17,754 miles of improved and two-track roads in the programmatic PRB FEIS (page 2-18).

Cumulative Effects: Compressors contribute the majority of regulated air pollution emissions associated with CBM development projects. One new compressor located on private land would be constructed for this project. Existing compressors or proposed compressors previously analyzed would also be utilized. A cumulative effects analysis including the existing compressors and power generators was conducted and is described in the *“Technical Support Document, Air Quality Impact Assessment for the Montana Final Statewide Oil and Gas EIS and Proposed Amendment of the Powder River and Billings Resource Management Plans and the Wyoming Final EIS and Planning Amendment for the Powder River Basin Oil and Gas Development Project.”* (Argonne 2002) The maximum impacts would be approximately 30% of the NAAQS and WAAQS for NO₂ that would protect public health and welfare with an adequate margin of safety (Table 4-89, Page 4-384). No air quality standards would be exceeded by cumulative emissions.

Long term, wells would be powered using new underground line power connected to existing infrastructure rather than by diesel or natural gas fired generators. However, until power lines become available, natural gas fired generators would be utilized as discussed previously in this section. Cumulative air emission impacts from these temporary generators would as stated in the PRB EIS. As previously stated, vehicle traffic and associated emissions would increase slightly as a result of the Proposed Action. These increases are not expected to cause or

contribute to violations of State or Federal air quality standards, and would not likely result in adverse effects on ambient air quality within the project area.

A detailed cumulative effects analysis including potential emissions from this project was conducted, and is described in the Powder River Basin FEIS (pages 4-377 through 4-392; and Appendix F) (USDI BLM 2003)

Additional Information:

Additional information regarding air quality effects analysis can be found in the following documents:

- Final Environmental Impact Statement and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project (USDI BLM 2003, pages 4-377 through 4-392; and Appendix F),
- Air Quality Impact Technical Support Document for the Powder River Basin FEIS (Appendix F of USDI BLM 2003)

The 10 CBM wells described here are of the same type and subject to the same air quality laws as those analyzed in the above documents. Additional information regarding direct and indirect effects on air quality from a typical CBM well can be found in the discussions contained in the above listed documents.

4.3.2 ALTERNATIVE B - NO ACTION

Direct, Indirect and Cumulative Effects: Air quality within the region would remain under the influence of existing emission sources and other sources that could come into existence on private, State or other Federal lands.

Table 4.3: Summary of Direct and Indirect Effects on Air Quality by Alternative

	Alternative A (Proposed Action)	Alternative B (No Action)
Compressors	One natural gas engine driven compressor would be built; therefore, additional emissions from that compressor would occur at a rate of approximately 6.17 tons of NOx per year (0.017 tons NOx per day).	No new compressors would be built, therefore, no additional emissions from compressors would occur
Generators	Temporary natural gas-fired generators would be used for some time prior to utility power becoming available. Emissions from the generators are estimated at 0.49 tons of NOx per year (0.0013 tons NOx per day).	No new generators would be built; therefore, no additional emissions from generators would occur.
Fugitive Emissions from Wells	Fugitive emissions from wells would be minimal and would only occur during construction. Fugitive emissions from wells are not regulated by WDEQ and were not quantified. No emissions from well flaring would occur as the wells are not flared during testing.	No new fugitive emissions from wells would occur.

Table 4.3 (cont.)

	Alternative A (Proposed Action)	Alternative B (No Action)
Fugitive Dust (PM₁₀ + PM_{2.5})	0.11 tons of combined PM ₁₀ and PM _{2.5} emissions per day were estimated to occur during the construction period from vehicle traffic on new and existing unpaved roads. This represents a conservative estimate during the highest use days. Actual emissions are likely to be lower, especially after the construction phase is completed.	Slight increases in traffic on existing roads may occur as trends in recreation use change over the years yielding slight increases in fugitive dust emissions.
Vehicle Exhaust	0.0005 tons of NO _x emissions per day were estimated to occur during the construction period from vehicle traffic on new and existing roads. This represents a conservative estimate during the highest use days. Actual emissions are likely to be lower, especially after the construction phase is completed.	Slight increases in traffic on existing roads may occur as trends in recreation use change over the years yielding slight increases in vehicle exhaust emissions.

4.4 WATER RESOURCES

Surface Water

The Thunder Basin POD area is located primarily within the Little Thunder Creek drainage. The lone exception is a water-discharge outfall in the Boss Draw drainage, a tributary to Porcupine Creek. Little Thunder and Porcupine Creeks are tributaries to the Cheyenne River. Little Thunder Creek flows east into Black Thunder Creek, which drains into the Cheyenne River. Porcupine Creek flows southeast into Antelope Creek, which drains into the Cheyenne River. Little Thunder Creek at U. S. Geological Survey gauging station #06375600 has a drainage area of 234 square miles and stream elevations range from 5,100 to 4,040 feet. The gradient of the stream channel averages 0.3 percent. Black Thunder Creek, at gauging station #06376300, has a drainage area of approximately 535 square miles (Peterson 1988 p.256). Porcupine Creek at its confluence with Antelope Creek has a watershed of 139 square miles with stream elevations between 5,280 and 4,460 feet. The stream channel gradient averages 0.2 percent. Antelope Creek at gauging station #06364700 has a drainage area of 959 square miles.

There are no natural springs or seeps in the project area. There are three (3) PEM (palustrine emergent wetlands) on NFS land in the project area. These wetlands are not located in areas where CBNG wells will be located and, therefore, not expected to be affected by the project.

The Cheyenne River and its tributaries are ephemeral streams with periods of no flow for many days each year. Channel types range from undefined swales in the headwaters of the tributaries to well-defined channels in the major streams.

A gauging station was operated by the U.S. Geological Survey on Black Thunder Creek, near Hampshire, WY during 1972-90. Flows during the period of record ranged from 5,050 cubic feet per second (cfs) to no flow. Based on the streamflow record, nearly 80 percent of the annual runoff occurs from March through July and approximately 37 percent occurs in May (Peterson 1988). Lowry et al. (1986, p. 54) analyzed flow-duration curves for the Black Thunder gauging station and concluded that the stream has no base flow and derives flow from direct runoff.

Surface waters in the project area commonly contain high dissolved-solid concentrations. Nearly half the stations analyzed by Lowry et al. (1986) had concentrations higher than 2000 mg/L, with the highest values of 7000 mg/L found in the Belle Fourche basin located to the north of the project areas. Dissolved-solids concentration varies inversely with discharge and fluctuates seasonally in relation to runoff. So, surface waters in this area tend to have high alkalinity concentrations (>100 mg/L as calcium carbonate) and are generally above pH 7 (Lowry et al. 1986). This alkalinity assists streams that are downstream from coal mines in neutralizing any possible acid mine drainage.

The existing environment for surface waters meets the desired conditions for surface waters discussed in Chapter 3.0. Additional information about the surface water in the POD is in the aforementioned references, as well as in the Water Management Plans.

Ground Water

The project area in southeastern Campbell County is overlain by thick deposits of Tertiary sediment (Fort Union and Wasatch Formations) in the Powder River Basin (PRB). The POWDER RIVER GEOLOGIC BASIN is characterized as a large structural and topographic basin bordered by the Black Hills on the east and the Bighorn Mountains on the west. Ground-water systems in the area are typically discontinuous aquifers in lenticular sand and silt bodies interbedded with shale and coal. Regional ground-water flow is generally to the northwest. Larson (1984, p. 20) reported the median total dissolved-solids (TDS) concentration for ground water from wells sampled in Campbell County as 1,220 mg/L (Figure 4-2). The median concentration for wells sampled in Converse County, which lies just to the south of the project area, was reported as 475 mg/L (Figure 4-3). The Fort Union Formation had a median concentration of 1,230 mg/L in Campbell County and 390 mg/L in Converse County, while the Wasatch Formation was reported at 1,220 mg/L in Campbell County and 420 mg/L in Converse County. Ground water is an important water source in the area because potential evaporation is higher than precipitation for much of the basin. Shallow wells (<500 feet in depth) provide most of the water used for domestic and livestock purposes.

The ground water from CBM wells in the project area is from the Paleocene Wyodak coalbed member of the Fort Union Formation. The Wyodak coalbed ranges from 25 to 175 feet thick with an average thickness of 70 feet (Lowry et al. 1986, p. 26). Confined between basal shales of the overlying Wasatch Formation and thick shale deposits below, the Wyodak coalbed is the most continuous aquifer in the areas. The coalbed dips slightly to the west at approximately 45 feet per mile (Denson and Keefer 1974).

The Wyodak is subdivided into the Anderson and Canyon coalbeds in the project area. The coalbed is often divided further into multiple coal layers interbedded with sandstone, claystone, and shale, and is associated with clinker beds along outcrops of coal (Martin et al., 1988). These lithologic inconsistencies affect the flow of water, though transmissivity is primarily a function of the direction and degree of cleating (fracturing) within the coal body. Transmissivity within the Wyodak coalbed is generally less than 134 square feet per day (ft²/d), and the aquifer typically yields 10 to 50 gallons per minute (gpm) (Hadley and Keefer, 1975). The Wyodak coal member is recharged primarily through clinker outcrops located throughout the study areas (Martin et al. 1988).

The Wasatch aquifer lies above the Wyodak coalbed aquifer and stores water within discontinuous, lenticular sand bodies, and paleochannels surrounded by shale and siltstone.

Though the shale and siltstone may be saturated with ground water, wells completed in these lithologies do not yield as much water as wells completed in the nearby sand bodies. Transmissivity in the Wasatch aquifer generally is less than 13 ft²/d, and often is less than 1.3 ft²/d. Wells in the sand bodies yield approximately 50 gpm in the northern portion of the Powder River basin and as much as 500 gpm in the southern portion of the basin (Hodson et al., 1973, pl. 3). Recharge to the Wasatch aquifer is derived chiefly from infiltration of precipitation through surface exposures of the more conductive sand bodies (Martin et al., 1988). Recharge also occurs through the alluvium in the stream channels, as well as by lateral movement from clinker or scoria.

Some ground water is contained within recent sediment (Quaternary alluvium) in saturated zones generally less than 20 feet thick. These zones are present in stream valleys within the POD; however, the alluvium is composed of fine-grained sediment that generally does not yield large quantities of water (Lowry et al. 1986, p. 90).

4.4.1 ALTERNATIVE A – PROPOSED ACTION

Under the Proposed Action, 10 wells in the project area would be added to the 30 producing and planned wells within one mile of the project area. Impacts to the watersheds would be only very slightly greater with the addition of these 10 wells. Potential impacts to watersheds would be minimized by discharging project-produced water into an existing reservoir where evaporation and infiltration would occur. This would minimize the potential for downstream flows. The reservoir would be fitted with trickle tubes to allow a flushing flow during storm events of long duration. Upgrading of existing reservoirs is addressed in Section 2.1.4 of this EA, as well as in the Water Management plans that are available in the Project Record at the Douglas Ranger District office.

In addition to the impacts indicated in Alternative A, surface and ground water quality in the analysis area could be compromised by accidental spills of petroleum products or other pollutants during construction. Also, produced water of poor quality could decrease the quality of water stored in the receiving reservoirs and/or downstream. However, the risk associated with such impacts would be reduced to a level that is not significant by application of the mitigation measures discussed in Section 2.5 of this EA. Additional precautionary measures would include worker briefings prior to drilling and construction, use of quality construction materials and methods, and the application of proper health and safety techniques.

With the implementation of mitigation measures discussed in Section 2.5 of this EA, the Proposed Action would meet the desired condition of the project area regarding surface water.

Direct and Indirect Effects Surface Water:

With the addition of the 10 project wells, initial water production would be increased by 115 gpm or 0.26 cfs. The produced water would be discharged into in the Little Thunder Creek watershed and in the Boss Draw/Porcupine Creek watersheds as shown on the project maps.

Measurements of streamflow to determine seepage loss in the channel were obtained at five locations on Little Thunder Creek on September 12, 2001. In the sandy headwaters, channel seepage exceeded 100 gal/min in a reach 800 feet. Seepage loss decreased in downstream reaches where the soils become richer in clays. Similar sets of streamflow measurements have been conducted on small streams for other coalbed methane projects in the Powder River Basin

(Lowham Engineering LLC, August 2002 pg 05-06). These measurements show seepage losses from 20 to over 100 gal/min per mile of stream channel, with the larger losses occurring in sandy areas.

Additional water loss occurs in reservoirs. Based on studies of the hydrology of small stock ponds in northeastern Wyoming, significant loss of water occurs from evaporation and seepage. Data obtained from 54 reservoirs during 1951-54 showed evaporation averaging about 0.4 ft per month during the spring and summer months, and seepage of about 0.8 ft per month (Culler, 1961). Cleaned-out reservoirs would have a much higher seepage rate than the existing reservoirs measured by Culler.

Evaporation rates were measured by Lenfest (1987) for selected streams in the Powder River Basin, Wyoming and Montana. The net surface area of the alluvial valley was found to have a significant effect on the amount of evaporation discharge. For example, for a stream with an alluvial valley width of 200 feet, evaporation during April through October was found to be 0.12 cubic feet per second (cfs), or 54 gal/min. per mile. A stream with an alluvial valley of 100 ft was found to have evaporation of 14 gal/min per mile. During other months of the year, rates would be much less, perhaps 25 percent of the growing-season amount.

Given the sandy composition for much of the project area, the average loss due to seepage and evaporation is estimated to be about 80 gal/min per mile of stream channel, with additional losses of from 40 to 80 gal/min occurring in the reservoir.

During flushing flows, and periods of high flow, minimal amounts of discharged CBNG project-related water is expected to flow downstream into Olson Draw. The Tracy Reservoir, located on Olsan Draw, which flows into the Little Thunder Creek, would be upgraded to accommodate these periodic high flows. As previously stated, the lone outfall on Boss Draw would be used for supply of dust control water to a coal producing company. This outfall is located approximately one-half mile south of the POD on private land. During flushing flows and periods of high flows, minimal amounts of discharged CBM project-related water could continue down Porcupine Creek.

The construction roads, utility corridors, and wells would increase erosion until vegetation is reestablished. Following Initial disturbance (drill pads, roads, pipelines, etc.), erosion rates are expected to return to pre-operational conditions. Upland sediments will be collected and settled in the reconstructed reservoir. Erosion-prevention measures as detailed in Section 2.5 would be implemented for construction activities. A Storm Water Pollution Prevention Plan would be prepared in accordance with regulations of WDEQ-WQD.

Erosion problems, such as downcutting or headcutting, are possible in stream channels within the project area. If any such problems arise, mitigating actions would be taken. Typical mitigation actions are reshaping and rip-rapping head cuts and stream banks and similar actions as described in the Powder River Basin FEIS (USDI BLM 2003 on pages 4-392 to 4-406). An additional mitigation would be a downstream survey in Olson Draw postproduction to determine erosion problems. The normally high dissolved-solids concentration is also expected to be lower in waters contained in reservoirs (Lowry et al., 1986, p. 56). In addition, reservoirs offer many dispersed watering sites for livestock and wildlife. This distribution of watering holes would decrease the effects of animal-propagated channels and associated erosion.

A National Pollutant Discharge Elimination System permit would be obtained from WDEQ-WQD prior to any discharge of water. Companies producing CBM wells are required to monitor and

report on the volume and quality of produced water. Discharges are required to meet WDEQ regulations and water-quality standards (USDI BLM, 2003). Monitoring will be done as specified in the water management plans. Data derived from this monitoring will be submitted to the appropriate agencies, as required by current permitting requirements.

If necessary on lease, additional low water crossings and culverts would be installed at downstream locations within the boundary of the lease. However, numerous stream crossings already exist in the vicinity of the project. It is not expected that more than an incidental amount of produced water would leave the lease-area.

Cumulative Effects Surface Water:

Spatial Scale: There is much uncertainty associated with quantification of water conveyance losses from produced CBM water. For the purposes of this surface water resource cumulative effects analysis, water loss due to evaporation, seepage and infiltration based on information in Lowry (Lowry, et. al., 1986), Culler (Culler, 1996), Lenfest (Lenfest 1987) and Lowham (Lowham Engineering, LLC 2002)} was estimated to be 0.1 cfs loss per mile in channel and an additional 0.1 cfs loss for each reservoir. Field measurements conducted on Little Thunder Creek by Lowham Engineering for this project found channel seepage exceeded 100 gal/min (0.27 cfs) in one sandy reach.

Thunder Basin proposes 10 wells with a 0.26 cfs discharge at one location on Olson Draw. Using the assumptions above the produced water from this project alone is unlikely to reach Little Thunder Creek (approximately 5 miles downstream, with one reservoir). Full development in the watershed could result in produced water from Olson Draw reaching Little Thunder Creek and traveling several miles downstream.

Temporal Scale: The life of coalbed methane wells varies, but is generally assumed to last 10-20 years, with declining rates of produced water over time. While Yates projects that project wells will have life of 15 years, for the purposes of this surface water resource cumulative effects analysis, 20 years was used for the evaluation of the effects, to evaluate the maximum potential effects.

Past and Present Projects: Past and present coalbed methane development is common in the vicinity of the project. Both mining and CBM development result in water collection and discharge to surface drainages.

For the Thunder Basin area, "There are currently no existing CBM wells that produce water upstream from this portion of the Olson Draw Drainage basin." (Gene R. George & Associates, 2002, section 4.0). The Forest Service has received other proposals for CBM projects in the Little Thunder Creek drainage. Little Thunder Creek is tributary to Black Thunder Creek, which is tributary to the Cheyenne River. For the larger Upper Cheyenne River drainage (10120103), existing CBM discharge was estimated to be 8.4 cfs in 2001, with 125 discharge outfalls covered under 37 discharge permits (USDI BLM, 2003, p 3-44, Table 3-10).

Reasonably Foreseeable Future Projects: Future coalbed methane development is projected in the Water Management plan (Gene R. George & Associates, 2002, section 4.0). Increased sedimentation may occur in the upper Cheyenne River Sub-watershed through expansion of the DM&E Railroad into the Powder River Geologic Basin.

For the Thunder Basin area, the Forest Service has received proposals for CBM projects including the Big Porcupine CBM project. Estimates provided in the WMP for the portion of the small headwater drainages upstream of the project area indicate development potential (which would include the proposed projects mentioned above) for an additional 5 wells and total discharge, with full simultaneous development, of 0.13 cfs. Future development in the Upper Cheyenne River drainage is estimated to result in peak flows in 2003 ranging from 18-19 cfs (depending on alternative) for the mainstem of the Upper Cheyenne River (USDI BLM, 2003, p4-83 – 4-85).

Alternative A Cumulative Effects: The cumulative effects of past, present and reasonably foreseeable future coalbed methane development have been extensively analyzed in programmatic environmental analyses and this analysis adopts and incorporates by reference those analysis's for cumulative effects from the Powder River Basin FEIS (USDI BLM 2003 p4-115 – 4-117 and 4-122 – 4-124). The effects of this project are expected to be proportional to the cumulative effects of overall development in the respective drainages. This project is expected to contribute to the effects summarized in these programmatic documents including “[n]oticeable changes in water quality of main stems during periods of low flows. [National Pollution Discharge Elimination System] permit conditions would provide enforceable assurance that water quality standards and designated uses would not be degraded from discharges of CBM produced water.” (Powder River Basin EIS p2-76). “Concentrations of suspended sediment in surface waters [are] likely to rise above present levels as a result of increased flows and runoff from disturbed areas.”(Powder River Basin EIS p2-77) (USDI BLM 2003). CBM produced water would contribute to surface flows and “[p]erennial flows [are] likely to develop in formerly ephemeral channels” (Powder River Basin EIS p2-76) (USDI BLM 2003).

This project proposes only 10 wells in a relatively confined area and the direct and indirect effects of this individual project are not significant. This project will contribute to the cumulative effects to surface water from past, present and reasonably foreseeable future coalbed methane development which are disclosed in the programmatic environmental assessments (e.g. Powder River Basin EIS p4-115 – 4-117 and 4-122 – 4-124) (USDI BLM 2003). These cumulative effects are summarized in the above paragraph. The Thunder Basin project has the potential to contribute an additional 0.26 cfs to the existing permitted discharge of 8.4 cfs in the larger Upper Cheyenne River watershed (3% increase). The 0.26 cfs discharge is approximately 1% of the potential CBM produced water mainstem peak flow of 18 cfs in the Upper Cheyenne River. It is unlikely that the discharge from this project would contribute the total discharge amounts described above, since reservoir storage, evapotranspiration, and seepage are expected to result in water loss on-site before reaching other areas with CBM discharges (See Direct and Indirect Effects Surface Water). Additionally the total discharge amounts are likely to be less than those described above due to water losses on past and present projects, phasing of projects over time and declining rates of produced water discharge over the life of wells. Evaluation of this project in relationship to Antelope Creek and the Upper Cheyenne River mainstems is provided for relative cumulative effects comparison purposes only. Full CBM development in the project area watersheds may result in produced water reaching Porcupine and Little Thunder Creeks, but not the mainstem of Antelope Creek or the Upper Cheyenne River.

Direct and Indirect Effects Ground Water:

Thunder Basin proposes 10 wells with an 115 gpm rate of groundwater removal. A direct effect of the Thunder Basin project is an estimated depletion of 217.6 acre-feet of ground water (11.5 gpm/well initially, approximately 85% decline rate every two years (Gene R. George & Assoc.,

2003 and 2004 Table 5) X 10 wells, estimated 10 year lifespan of well) over the life of the project. Due to the sandy quality of the project areas, much of the discharged water would recharge shallow aquifers through infiltration. This seepage would be primarily through reservoirs holding water as well as through stream channel loss. This water would likely recharge shallow aquifers in the Wasatch Formation. The lenticular, discontinuous nature of the Wasatch sand bodies would likely result in seepage of the discharged water into adjacent rock layers or nearby tributaries. According to published literature, "...surface water losses occurring in several drainages of the Powder River Geologic Basin receiving CBM produced water during dry conditions indicate that conveyance losses range from 64 percent to 100 percent of inflows" (Meyer 2000, Babb 1998). Conveyance losses are the result of evapotranspiration and seepage into alluvium and bedrock below stream channels. Recharge of shallow alluvial aquifers is estimated to account for more than 80 percent of the conveyance loss (Powder River Basin EIS p4-3). Overall the project is expected to deplete water from deeper aquifers, but much of that water will recharge shallow alluvial aquifers.

Localized reductions of ground water levels may result in indirect effects including reduced productive capacity of existing water wells in the area. Eleven (including four Forest Service) water wells are located within one mile of the Thunder Basin project area and could be adversely affected by localized reductions of ground water levels from this project (Wyoming State Engineers Office Website, 2003). Mitigation requiring operators on federal minerals to offer a Water Well Agreement that protects nearby water wells permitted with the Wyoming State Engineers Office (WSEO) will reduce potential adverse affects from localize reductions in ground water (See Ground Water Mitigation section).

Ground water chemistry also has the potential to change due to leakage or infiltration of water with different chemical compositions to different aquifers. Leakage from the Wasatch formation to the Fort Union formation could occur as CBM development removes water from the Fort Union coal aquifer, but if procedures in place for drilling and completing wells are strictly followed mixing of water between formations is expected to be minimal (Powder River Basin EIS p4-53). Produced water will have a unique chemical composition which is different than surface waters and the shallow alluvial aquifer water which much of it will mix with due to infiltration. "Limited monitoring data from shallow alluvial wells suggests that CBM produced water that has infiltrated unsaturated alluvial materials resembles naturally occurring alluvial water quality very near the surface" (Powder River Basin EIS p4-54).

Cumulative Effects Ground Water:

Spatial Scale: Direct and indirect effects of the project focus on the potential effects of groundwater depletion within 0.5 – 1.0 mile radius of proposed wells which may effect municipal or stock water wells in the area. Ground water cumulative effects analysis will focus on past, present and reasonably foreseeable future projects that have the potential to affect groundwater aquifers in the Fort Union and Wasatch formations. These are large and connected formations which span the Powder River Basin. Thunder Basin proposes 10 wells with a 111 gpm rate of groundwater removal. This removal, while only to a small amount, would affect these massive ground water aquifers that underlie the Powder River Geologic Basin.

Temporal Scale: "Water levels [as a result of draw down from CBM pumping] eventually would recover to within 20 feet or less of pre-operational levels over the next hundred years or so (Powder River Basin EIS p2-75). For the purposes of this groundwater resource cumulative effects analysis, 100 years was considered.

Past and Present Projects: Coal mine activities such as dewatering wells are occurring within ¼ mile of the project area and contribute to cumulative ground water effects. The mine dewateres the coal seams ahead of mining the coal. With rare if any exceptions, the CBM wells in the Powder River Geologic Basin contribute to the cumulative impacts to the massive Fort Union and Wasatch formations groundwater aquifers.

Reasonably Foreseeable Future Projects: Coalbed methane development is analyzed in the Powder River Basin EIS (USDI BLM, 2003). There are numerous proposals for development of a variety of CBM projects that will contribute to groundwater effects in this project area. Some of these projects are: Big Porcupine, Sioux Ranch, Gray Creek and Black Butte Draw Porcupine Federal POD, Yates Dragline, Merit energy, Big IPC Porcupine, Little Porcupine, South Porcupine and Thunder head PODs. The level of development occurring is that projected in the Powder River Basin EIS (USDI BLM 2003 Appendix A) Reasonably Foreseeable Development Scenario. Continued coal mining is expected to remove about 1 million acre feet of groundwater from the coal zone aquifer (USDI, BLM, 2003, p4-65).

Alternative A Cumulative Effects: The cumulative effects to groundwater of past, present and reasonably foreseeable future coalbed methane development have been extensively analyzed in Powder River Basin EIS and this analysis adopts portions of these documents to analyze the cumulative effects of this project (USDI BLM 2003, p 4-64 through 4-69).

The effects of this project are expected to be proportional to the cumulative effects of overall development in the respective aquifers. The Thunder Basin project has the potential to deplete an estimated 217.6 acre-feet of ground water (11.5 gpm/well initially, approximately 85% decline rate every two years (Gene R. George & Assoc., Table 5) X 10 wells, estimated 10 year lifespan of well) over the life of the project. Therefore this project is estimated to contribute approximately 0.007 percent of the total ground water removal estimated in the Powder River Basin EIS, (2003 p2-74). $(217.6 / 3,069,665 * 100)$. Some of the groundwater that is removed will infiltrate and recharge shallow alluvial aquifers.

The entire Powder River Basin CBM project is expected to result in removal of 3,069,665 acre-feet over the course of meeting the Reasonably Foreseeable Development Scenario (USDI BLM 2003 p2-74). Groundwater removal from CBM development and coal mining together are projected to be about 0.3 percent of the recoverable groundwater stored within the Wasatch and Fort Union Formations (USDI, BLM, 2003, p4-65). Maximum draw down in the Fort Union Formation could be up to 800 feet (USDI BLM, 2003, p 4-16) and recovery to near preoperational water levels could take a hundred years or so (USDI BLM 2003, p4-66). Groundwater quality within the regional aquifer systems and alluvial aquifers would not be noticeably affected (USDI BLM, 2003, p2-75, 4-52).

This project proposes 10 wells in a relatively confined area and the direct and indirect effects of this individual project are not significant. This project will collectively contribute to the cumulative effects to groundwater from past, present and reasonably foreseeable future coalbed methane development which are disclosed in the programmatic environmental assessments (e.g. Powder River Basin EIS, USDI BLM 2003, p4-64 – 4-69). These cumulative effects are summarized in the above paragraph.

4.4.2 ALTERNATIVE B – NO ACTION

Many activities that impact stream flow and water quality in the area are either ongoing or likely. The desired condition of surface waters, as discussed in Chapter 3.0, on NFS lands in the project area would continue to be met. Drilling could continue on State and private leases. Access and pipelines across federal lands in the project area might still be granted Powder River Basin FEIS (USDI BLM 2003). Little if any water produced from the 10 Thunder Basin CBM wells that would be developed under the Proposed Action, will flow out of the reservoirs receiving the CBM water. Thus, the impacts to downstream flow and water quality under the No

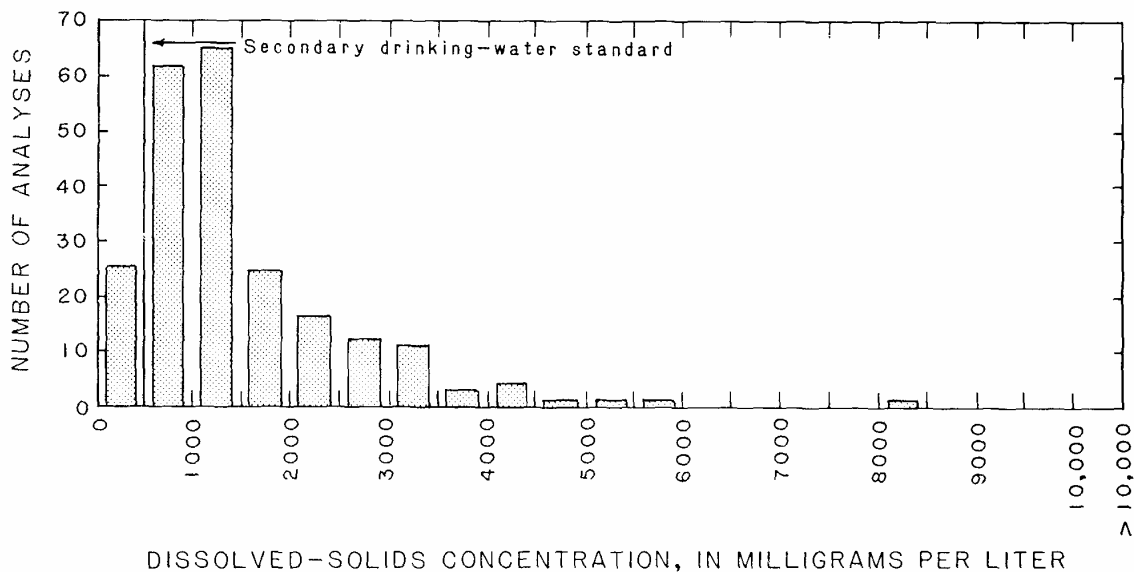
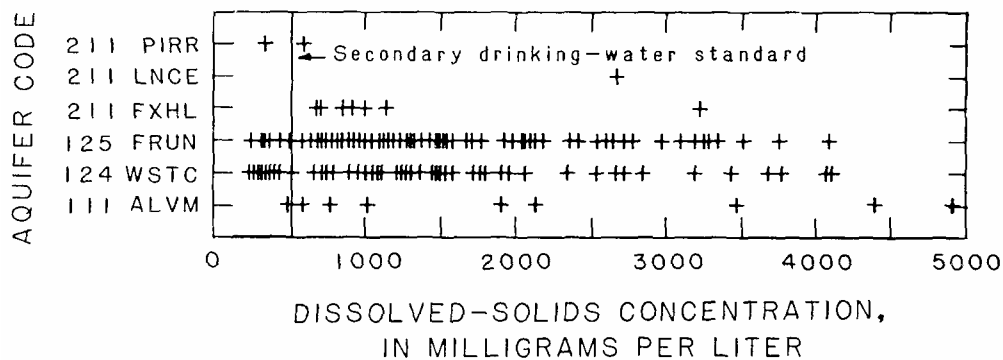


Figure 4-2: Dissolved-solids concentration by formation in Campbell County

(adapted from Larson, 1984). FRUN = Fort Union, WSTC = Wasatch, ALVM = Alluvium.

Action Alternative would be only slightly less than the water impacts associated with the Proposed Action alternative.

Thirty other wells within one mile of the POD area have been permitted by the Wyoming Oil and Gas Conservation Commission (WOGCC). Of these 30 wells only 15 are CBNG wells and would discharge produced water into tributaries of Little Thunder and Porcupine Creeks.

Direct and Indirect Effects Surface Water:

Under the No Action alternative the 10 Thunder Basin wells would not be drilled and no water produced. Thus there would not be any direct or indirect surface water effects from them.

Cumulative Effects Surface Water:

Without the 10 Thunder Basin CBM wells, impacts will still occur in the analysis area from other wells. Approximately 600 gpm or 1.34 cfs of produced water would be discharged into tributaries from wells on other project areas in the analysis area. This figure was calculated using the assumption that the 30 wells within one mile of the project POD area would produce the maximum expected discharge of 20 gpm per well. It is unlikely that the discharge will rise to this discharge rate because: 1) production at some of the 30 wells in the analysis area is already occurring; 2) new wells would be phased in over several years; and 3) a decline in well discharge generally occurs after the first several months of operation. Never-the-less, streams that normally have no base flow could have flowing water. This increase in flow may affect the overall quality of the stream. Turbidity, salinity, and sedimentation in the tributaries could change in response to the increased water discharged from these wells and associated surface disturbances. However, the surface water is significantly higher in TDS than the Wyodak aquifer from which the CBM wells are producing. The discharge of water produced from CBM wells could thereby substantially improve the surface water.

Some of the discharged water will be lost to evaporation and evapo-transpiration. Produced water would also infiltrate and recharge shallow, discontinuous aquifers in the Wasatch Formation and associated alluvium. This infiltration could initiate recovery in nearby water wells offsetting the drawdown expected to occur in aquifers pumped through CBM activity.

The proposed coalbed methane wells on NFS lands would not be developed and no discharge points would be located on NFS lands. There would be no changes in water quality, flow regimes, or stream channel characteristics as a result of this project. Coalbed methane development on private and other federal ownership in the area would continue and may have an affect on water quality, flow regimes, and/or stream channel characteristics.

Direct and Indirect Effects Ground Water:

The project would not have direct and indirect effects on ground water since the 10 Thunder Basin CBM wells would not be developed.

Cumulative Effects Ground Water:

The proposed coalbed methane wells on NFS lands would not be developed and no removal of groundwater would occur from NFS lands. There would be no changes in water levels as a result of this project. Coalbed methane development on private and other federal ownership in the area will continue and will have an affect on groundwater levels.

Water levels will continue to decline in the Wyodak aquifer as a result of existing and planned adjacent coalbed methane projects and existing nearby coal mining. The removal of water by coalbed methane developments from the coal is unlikely to have any effects on the aquifer in terms of its ability to store and transport water. Many factors would influence how nearby water wells are affected including proximity to CBM wells, depth, completion interval, and yield required to maintain the water well as a usable source.

4.5 LIVESTOCK GRAZING & RANGE IMPROVEMENTS

The Thunder Basin project area falls within the area permitted for livestock grazing by the Thunder Basin Grazing Association (TBGA). TBGA grazing involves National Forest, State and private lands used for livestock grazing. The project area falls within three different grazing allotments of the TBGA: Allotment #240, Allotment #280 and Allotment #284. These allotments are used by two different association members and are stocked with cattle, and are used at various times throughout the year.

The two primary types of structural range improvements within the project area are fences and water developments. The project area has multiple allotment boundary fences and interior pasture fences. Eleven (including four Forest Service) water wells are located within one mile of the Thunder Basin project area. There are numerous stock dams/pits in the analysis area.

4.5.1 ALTERNATIVE A – PROPOSED ACTION

Direct and Indirect Effects: Direct and indirect effects on rangeland vegetation will be minimal. Under the Proposed Action, approximately 27.44 acres of rangeland vegetation would be disturbed during the construction phase. Of this, approximately 13.97 acres would remain disturbed for the 10 to 20 year life of the project as well pads, access roads, or facility locations. The remaining 13.47 acres would be reseeded and reclaimed following the completion of construction. This short-term and long-term vegetation removal would reduce available forage for cattle and sheep. Loss of forage would be minimal and would not result in a need to change permitted levels of livestock grazing on those NFS lands. The main impact on livestock grazing will be the possibility of gates being left open. This could allow livestock to move between pastures and possibly mix with neighboring livestock.

Potential impacts to water wells are a primary concern. If CBM wells are drilled into the same aquifer as stock water wells, the process of extracting the methane could cause drawdown in adjacent stock water wells. This could cause a reduction in available water for cattle and sheep, as well as a potential for methane migration into the stock water well. However, in order to avoid this potential impact, Yates has developed water well agreements with allotment leases in the project area (see Impact Avoidance and Mitigation Measures for Surface Waters in Section 2.6).

Discharge of CBM water into reservoirs would beneficially affect livestock by providing additional watering sources.

Cumulative Effects: Other CBM development in the project area and surrounding region could have a cumulative impact on stock water wells and springs in the area. This cumulative impact could be minimized by doing monitoring at existing water wells. Monitoring of wells would

enable to FS to track the number and extent of stock water wells being impacted by water drawdown effects and/or methane migration.

Cumulative groundwater effects of CBM development is studied in great detail and scope in the Powder River Basin EIS. Summarizing, drawdowns will occur due to development of CBM wells in concert with mining of coals from the same seams. Recovery to within 25 feet of preoperational levels will take approximately 25 years after operations have ceased. Recovery to preoperational levels would take tens to hundreds of years (PRB EIS, 2003, p 4-66). As the Thunder Basin POD is in the far southeast area of the Powder River EIS analysis area, the drawdown models show low drawdowns (25 to 50 feet) for this area (see drawdown model maps, PRB EIS, 2003, p 4-17 through 4-33).

4.5.2 ALTERNATIVE B – NO ACTION

Direct, Indirect and Cumulative Effects: Under the No Action Alternative, livestock and rangeland management would not change. Livestock forage would not be directly, indirectly or cumulatively affected by CBM development in the project area. Stock water wells would continue to be potentially affected by drawdown and/or methane migration due to CBM or mining development on adjacent lands. Under the No Action Alternative, the beneficial effect of CBM produced water reservoirs would not occur in the project area.

4.6 RANGELAND VEGETATION RESOURCES

Upland Vegetation

The majority of the project area is in upland sites. Upland vegetation is dominated by western wheatgrass (*Pascopyrum smithii*), blue grama (*Bouteloua gracilis*), and big sagebrush (*Artemisia tridentata*). There are lesser densities of junegrass (*Koeleria cristata*), bluegrasses (*Poa spp.*), sedges (*Carex spp.*), cactus (*Opuntia polyacantha*), needle and thread (*Stipa comata*), and various annuals, including cheatgrass (*Bromus tectorum*) and six weeks fescue (*Vulpia octoflora*). Sandy soil sites in upland areas often include little bluestem (*Andropogon scoparius*) and yucca (*Yucca glauca*) plant communities.

Riparian vegetation

Riparian vegetation is dominated by western wheatgrass, bluegrasses (*Poa spp*), sedges (*Carex spp*), rushes (*Scirpus spp* and *Juncus spp*), needle grasses (*Stipa spp*), and blue grama. There are a few scattered cottonwood trees (*Populus spp*) and willows (*Salix spp*) in the area. Flood plain areas and playas with alkaline soils support greasewood (*Sarcobatus spp*) shrub communities with a western wheatgrass, blue grama, cheatgrass, and saltgrass (*Distichlis spicata*) understory.

Noxious weeds

Noxious weed infestations have been increasing in recent years. The only known weed infestation in the project area is Canada thistle, which is mainly found in the drainages. There are also knapweeds and saltcedar infestations found in the surrounding area. Undesirable and introduced plant species have been increasing in occurrence and abundance in recent years; most noticeable are cheatgrass, Japanese brome, and yellow sweet clover.

4.6.1 ALTERNATIVE A – PROPOSED ACTION

Direct and Indirect Effects: Under the Proposed Action, approximately 27.44 acres of sagebrush-grassland habitat would be disturbed during the construction phase. Of this, approximately 13.97 acres would remain disturbed for the 10 to 20 year life of the project as well pads, access roads, or facility locations. The remaining 13.47 acres would be reseeded and reclaimed following the completion of construction. Effects on the rangeland vegetation will be minimal. There will be some reduction of the vegetation. There could be an increase in the infestation of noxious weeds with the soil disturbance

Cumulative Effects: The Powder River Basin EIS details the cumulative impacts of CBM in the project area (4-164 through 4-172). Non-Oil & Gas impacts to the PRB EIS area total 2.8% of native vegetation in the Project Area. Oil & Gas cumulative impact would add approximately 2.7% of native vegetation in the PRB Project Area.

The long-term removal of 13.97 acres of common, upland vegetation is minimal. Yet in the context of cumulative impact analyses, each acre of vegetation disturbance within the Powder River Basin adds to a cumulative impact by increasing erosion, incrementally adding to overall native vegetation loss, and potentially increasing invasion of noxious weeds.

4.6.2 ALTERNATIVE B – NO ACTION

Direct and Indirect Effects: Under the No Action Alternative, the approximately 27.44 acres of upland vegetation types under discussion in the Proposed Action would not be disturbed by Yates's proposed CBM development.

Cumulative Effects: Vegetation resources would continue to be affected by existing disturbance sources; livestock grazing, OHV and other recreational use, and existing oil and gas activity. The primary effects of these activities include increased erosion and the potential for the spread of noxious and invasive weed species. Implementation of the No Action Alternative would have no CBM development-related cumulative impact on vegetation resources.

4.7 WILDLIFE RESOURCES

The Thunder Basin project area and surrounding TBNG supports a rich diversity of wildlife species and wildlife habitats. Information for the general habitat description and vegetation resources description provided in this section of the EA was obtained from *Biological Assessment, Biological Evaluation, and Appraisal of Management Indicator Species* (BA/BE/MIS) prepared by Thunderbird Wildlife Consulting (Clayton 2004, p2-4, Appendix A.). Vegetation community information was obtained during field surveys of the project area completed in May 2002.

Elevations within the project area range from 4,750 to 5,000 feet above sea level. The topography varies from level to rolling, to broken. Limited rough breaks habitat exists along portions of Olsen Draw and the upper reaches of Boss Draw. The most level terrain is at the eastern end of the survey area.

Vegetation in the project area is typical of the semi-arid Wyoming floristic region, where precipitation and soil parent material are controlling factors of plant composition and cover. The

primary vegetation community type in the project area itself is sagebrush-grassland. Common grasses include: needle-and-thread (*Stipa comata*), blue grama (*Bouteloua gracilis*), cheatgrass (*Bromus tectorum*), western wheatgrass (*Agropyron smithii*), and junegrass (*Koeleria macrantha*). The primary shrub, Wyoming big sagebrush (*Artemisia tridentata wyomingensis*), occurs throughout the project area in sparse to dense stands of small to medium sized plants (mostly <25 inches).

There are no perennial streams that cross the project area. The most prominent ephemeral drainages are Trussler Creek, Olsen Draw, and Boss Draw. Several stock reservoirs and dugouts provide additional potential wetland habitat. However, most of these features are ephemeral and were dry or nearly dry when visited during May and June 2002 (Clayton, 2004, p 2). Shoreline and emergent vegetation were sparse or absent and the water was turbid where present.

Trees on the project area are limited to three locations on the project area. The two species of trees identified in the project area by Clayton (2004, p2) include peachleaf willows (*Salix amygdaloides*) and plains cottonwoods (*Populus deltoides*).

Some information concerning historical wildlife usage of the project area was obtained from the Wyoming Game and Fish Department (WGFD), which maintains a computerized listing of wildlife species reported in an area. This listing, known as the Wildlife Observation System (WOS) was accessed for information concerning all species of wildlife (i.e., birds, mammals, amphibians, and reptiles) known to occur in the project area as residents or seasonal migrants. In addition the Forest Service maintains wildlife resource information specific to Thunder Basin National Grassland. This database, along with additional survey information for this area, was considered in this analysis. A final Biological Analysis and Biological Evaluation was accepted and approved by the USDA Forest Service wildlife Biologist on September 7, 2004. It provides the specific analysis disclosed below.

General Wildlife

Field inventories conducted by TWC in May and June of 2002 were completed. In addition, wildlife surveys for adjacent coal mines were conducted during 2003. A total of 43 bird and mammal species of wildlife have been recorded.(WGFD 2003). This species list is comprised of 10 mammals and 33 birds (Table 4.3). Additional species of birds and mammals, as well as reptiles, and amphibians are likely to occur in the project area. However, none were documented in the WOS or during field surveys by Thunderbird Wildlife Consulting (TWC). Although all the species listed in Table 4.3 are important members of ecological communities, most are common and have wide distribution within the region. Consequently, the relationship of most of these species to the proposed project is not discussed in the same depth as threatened, endangered or sensitive species, management indicator species and species of economic interest.

Raptors

The potential impacts of the proposed development on the burrowing owl and ferruginous hawk are discussed under the Threatened, Endangered and Sensitive Species section. However, the project area provides habitats for several other species of raptors. In addition to ferruginous hawk nests, there are two other intact raptor nests near the project area (Clayton 2004, p18). Those two nests are located in trees, and could potentially be used by ferruginous hawks, or Swainson's hawks.

Table 4.3. Wildlife Species documented in the Thunder Basin Project Area.

Common	scientific
hawk, rough-legged	<i>Buteo lagopus</i>
lark, horned	<i>Eremophila alpestris</i>
sparrow, vesper	<i>Pooecetes gramineus</i>
sparrow, lark	<i>Chondestes grammacus</i>
sparrow, brewer's	<i>Spizella breweri</i>
jackrabbit, white-tailed	<i>Lepus townsendii</i>
bobcat	<i>Lynx rufus</i>
deer, mule	<i>Odocoileus hemionus</i>
duck, mallard	<i>Anas platyrhynchos</i>
avocet, american	<i>Recurvirostra americana</i>
grouse, sage	<i>Centrocercus urophasianus</i>
eagle, bald	<i>Haliaeetus leucocephalus</i>
cowbird, brown-headed	<i>Molothrus ater</i>
Sparrow, savannah	<i>Passerculus sandwichensis</i>
bunting, lark	<i>Calamospiza melanocorys</i>
swallow, barn	<i>Hirundo rustica</i>
Thrasher, sage	<i>Oreoscoptes montanus</i>
coyote	<i>Canis latrans</i>
hawk, swainson's	<i>Buteo swainsoni</i>
falcon, prairie	<i>Falco mexicanus</i>
owl, short-eared	<i>Asio flammeus</i>
woodpecker, red-headed	<i>Melanerpes erythrocephalus</i>
flicker, northern	<i>Colaptes auratus</i>
raven, common	<i>Corvus corax</i>
shrike, loggerhead	<i>Lanius ludovicianus</i>
jackrabbit, black-tailed	<i>Lepus californicus</i>
cottontail, desert	<i>Sylvilagus auduboni</i>
weasel, long-tailed	<i>Mustela frenata</i>
dove, mourning	<i>Zenaida macroura</i>
harrier, northern	<i>Circus cyaneus</i>
hawk, ferruginous	<i>Buteo regalis</i>
eagle, golden	<i>Aquila chrysaetos</i>
owl, burrowing	<i>Athene cunicularia</i>
meadowlark, western	<i>Sturnella neglecta</i>
towhee, green-tailed	<i>Pipilo chlorurus</i>
mouse, deer	<i>Peromyscus maniculatus</i>
fox, red	<i>Vulpes vulpes</i>
pronghorn	<i>Antilocapra americana</i>
Long-billed curlew	<i>Numenius americanus</i>
Wilson's phalarope	<i>Phalaropus tricolor</i>
Chestnut-collared longspur	<i>Calcarius ornatus</i>
McCown's longspur	<i>Calcarius mccownii</i>
Lark bunting	<i>Calamospiza melanocorys</i>

Source: WGFD 2003

Migratory Bird Species

In May 2002, the USFWS Ecological Services office in Cheyenne, Wyoming released a revised list of 77 Migratory Bird Species of Management Concern in Wyoming. Of those 77 species, 1 was addressed in the BA section, 7 were addressed in the BE section, 1 was the Management Indicator Species, 1 was addressed in the Raptors section, 16 were considered for evaluation in the BE but not selected because of the limited potential for occurrence on the project area, 41 were not addressed in previous sections and have little potential for occurring, and 10 were not addressed in previous sections but could potentially occur on the project area (Clayton 2004, Table 5, 30-33) and are further addressed under the Threatened, Endangered and Sensitive Species section in this EA.

Of the remaining 67 species on the USFWS list, only nine nest and forage in upland grass or sagebrush-grassland habitats, and therefore, have the potential to occur in the Thunder Basin project area. The Brewer's sparrow (*Spizella breweri*) and sage thrasher (*Oreoscoptes montanus*) are big-sagebrush obligates. The chestnut-collared longspur (*Calcarius ornatus*), McCown's longspur (*Calcarius mccownii*), and grasshopper sparrow (*Ammodramus savannarum*) are restricted to grass dominated sites. The lark bunting (*Calamospiza melanocorys*), vesper sparrow (*Pooecetes gramineus*), lark sparrow (*Chondestes grammacus*), and short-eared owl (*Asio flammeus*) are less restricted in their nesting and foraging requirements, and utilize both sagebrush and grass dominated sites.

4.7.1 ALTERNATIVE A – PROPOSED ACTION

Direct and Indirect Effects:

General Wildlife

The Proposed Action could disturb up to 27.44 acres of terrestrial wildlife habitat during the life of the project. Approximately 13.97 acres of the potential habitat loss would be long-term, approximately 10 to 20 years. The remaining affected areas, an estimated 13.47 acres, would be associated with short-term effects lasting two to three years, or until the affected habitat is successfully reclaimed.

Long-term habitat losses would be associated with well access roads, wellhead facilities, other planned facilities, and all-weather roads to production sites. Access roads to unproductive wells, gathering lines, trunklines, and water discharge lines are considered to be short-term impacts as these areas would be reclaimed soon after construction during the following autumn or spring season.

Direct loss of habitat could reduce or eliminate forage, hiding cover, breeding sites, nesting cover, and thermal cover contained within the Thunder Basin project area. Terrestrial wildlife species dependent on the project area may become displaced. However, some species may adapt to CBM operations and this displacement effect may last only during the season of construction. Some species of wildlife in the project area may be permanently displaced by the proposed development or become less likely to inhabit or frequent the project area. Populations of species dependent upon and drawn to areas with more abundant surface water, such as waterfowl and shorebirds, may increasingly inhabit or frequent the project area.

Wildlife disturbances due to drilling within the project area would be less than that which is normally associated with conventional oil and gas drilling. Drilling at each of the 10 CBM wells

is expected to take only three to five days per well, as compared to a range between two weeks and two months for conventional oil and gas wells. Truck-mounted water well drill rigs would also be used to drill the CBM wells instead of the multi-component rigs used to drill conventional wells. This reduces the overall construction and clean-up period needed to complete an individual well site, and thereby reduces the effects of displacement due to human presence as compared to conventional oil and gas development.

Yates or a gas gathering contractor would be installing one new natural gas engine driven compressor on adjacent private land, so there would be a new noise impact as a result of the Proposed Action.

The managed discharge of CBM produced waters within the project area would likely benefit wildlife habitats and populations. Potential benefits likely would include the following: habitat creation or enhancement; increased availability of water to meet species' needs; increased forage productivity or carrying capacity; increased surface flows; and enlargement in existing reservoirs.

Raptors

Raptors within the Thunder Basin project area may be affected by the short-term loss of prey base associated with the long-term disturbance of up to 13.97 acres of upland vegetation habitats. Following the construction season, some raptors may be able to take advantage of increased prey availability and visibility in reclaimed areas. Most raptors are intolerant of human disturbance and would therefore be intolerant of drilling or construction activities during the nesting season. Alternative A would meet Grassland Plan standards and guidelines for ferruginous hawks. This is further discussed in section 4.8 of this EA.

Migratory Bird Species

The construction and maintenance of roads, gas wells, pipelines, and facilities will result in the long-term disturbance of 13.97 acres of the project area and have a relatively minor impact on populations of the species of migratory birds previously discussed. Nevertheless, those features will fragment native habitats and the landscape in general. As long as pipeline routes, auxiliary roads, and well sites are eventually reclaimed with native seed mixtures, the permanent habitat impacts will be minimal. The disturbance of upland grass and sagebrush habitats may displace pairs of some of those nine species from historic nesting territories. Also, there is always a risk of destroying active nests of ground or shrub nesting birds if surface disturbing activities (e.g., road building, construction, excavations, off-road driving, etc.) are conducted during the breeding season (approximately April through July).

Cumulative Effects: Ongoing and planned mineral development activities within the Powder River Basin would further reduce the amount of available cover, foraging opportunities, and breeding areas for a wide variety of wildlife trophic levels. Additional development could preclude wildlife, such as big game, raptors and migratory birds, from using areas of more intensive human activity Powder River Basin EIS, UDSI BLM, 2003 (p 4-231—4-235). In general, the severity of the cumulative effects would depend on factors such as the sensitivity of the species impacted, seasonal intensity of use, type of project activity, and physical parameters (e.g., topography, forage, and cover availability). Depending upon variables such as species behavior, density, and habitat, displaced or adjacent populations may experience increased mortality, decreased reproductive rates, or other compensatory or additive responses. The species most impacted would be those that rely primarily on Wyoming big sagebrush habitats. The implementation of the Proposed Action, and the resulting long-term disturbance of approximately 13.97 acres, is not likely to have an adverse effect on wildlife population viability.

in the project area. However, in the context of cumulative impacts, the 13.97 acres proposed for disturbance incrementally adds to wildlife habitat losses and overall habitat fragmentation within the Powder River Basin.

4.7.2 ALTERNATIVE B – NO ACTION

Direct and Indirect Effects: Under the No Action Alternative, the approximately 27.44 acres of habitat on Forest Service lands proposed for disturbance under the Proposed Action, would remain available for wildlife populations in both the long- and short-term future.

Displacement effects of construction crews, vehicles and equipment (including drill rigs, back hoes, etc.) would not occur on Forest Service lands, and therefore, wildlife within the Thunder Basin project area would not experience the potential effects of displacement or distress due to such activities.

Drilling activities intended to drain the target formation(s) under the action alternatives would continue to occur on adjacent private and State lands. Wildlife habitats on fee and State lands are not subject to the same wildlife protection measures required on NFS lands (e.g., raptor nest seasonal and spatial [distance limiting] stipulations).

Cumulative Effects: Implementation of the No Action Alternative would have no CBM development-related cumulative impact on wildlife resources on federal lands. Drilling on adjacent fee or State lands would contribute to cumulative effects as described under Alternative A.

4.8 THREATENED, ENDANGERED, AND SENSITIVE SPECIES AND MANAGEMENT INDICATOR SPECIES.

The potential for the alternatives to affect Federally listed species under the Endangered Species Act (i.e., threatened, endangered, candidate, and proposed species), U.S. Forest Service Sensitive Species, and selected Management Indicator Species was addressed in an in-depth Biological Assessment, Biological Evaluation, and Appraisal of Management Indicator Species (BA/BE/MIS/MIS) prepared by Thunderbird Wildlife Consulting (Clayton 2004). The BA/BE/MIS analyzed wildlife resources within all lands (both federal and private) proposed for CBM development by Yates as well as a one-half mile perimeter around the project area. This section of the EA summarizes the BA/BE/MIS; however, the full document is available at the Douglas Ranger Station in the project planning record. Table 4.4 summarizes the federally listed species, FS Sensitive Species, and the MIS potentially found within the project area, as well as the potential for their habitat(s) within the project area.

Every federally endangered, threatened, proposed, or candidate species that could potentially occur in the area was considered and selected for evaluation. The mountain plover (*Charadrius montanus*) was addressed in the *Biological Evaluation* section of this report since it is no longer (as of September 2003) a candidate for federal listing. The three species listed below were highlighted in the 9 May 2003 letter from the USFWS as those that could potentially occur within the project area and needed to be addressed.

Federally Listed, Proposed or Candidate Species

black-footed ferret (*Mustela nigripes*)

Prairie dog (*Cynomys* spp.) colonies constitute the principal habitat of the black-footed ferret (Hillman and Clark 1980). There are three black-tailed prairie dog (*Cynomys ludovicianus*) colonies totaling 36.6 acres that are within or partially within the project area (Exhibit 1). None of those colonies are scheduled to be physically disturbed by construction activities associated with the Thunder Basin CBM project. The small size and low density of colonies make it unlikely that ferrets would occupy the area (Forrest et al. 1985). Furthermore, despite extensive surveys for ferrets over the past 20 years, no wild populations have been discovered since 1981 (Miller et al. 1996). Those include numerous USFWS approved clearances for coal mining and other developments in the Powder River Basin of Wyoming. The colony located in Section 15, T42N, R70W was surveyed and cleared for ferrets during two winters, 1996-1997 (PRES 1997) and 2002-2003 (TWC 2003).

It is highly unlikely that ferrets even occur in the region. Even though limited ferret habitat exists within the project area, none will be physically disturbed. Consequently, there is little potential for the species to be impacted directly or indirectly by this project. Furthermore, the Project is not expected to increase the potential cumulative impacts to this species. The Project is outside of the area identified for potential black-footed ferret reintroductions on the Thunder Basin National Grassland, and consequently, will not impact those plans.

bald eagle (*Haliaeetus leucocephalus*)

Bald eagles feed primarily on large fish or carrion, and require large trees for both nesting and roosting (Johnsgard 1990). The species regularly migrates through and winters in Campbell County (Luce et al. 1999), and has been documented regularly during winter and early spring at adjacent coal mines (Clayton, 2004). Eagles that migrate through or winter in Campbell County probably roost communally in large stands of ponderosa pine (*Pinus ponderosa*), along wooded riparian corridors, or in smaller groups in large isolated trees. Those birds probably forage widely for lagomorphs or carrion. Nesting attempts are rare on the Thunder Basin National Grasslands (TBNG) (Beske 1994).

Ute ladies'-tresses (*Spiranthes diluvialis*)

The Ute ladies'-tresses is a threatened orchid that is endemic to moist, well drained soils near wetland meadows, springs, lakes, and perennial streams. It occurs generally in alluvial substrates along riparian edges, gravel bars, old oxbows, and moist to wet meadows. The complete absence of moist riparian habitats and the heavy clay soils of the project area, generally preclude the occurrence of that orchid. Furthermore, the discharge of water during gas extraction is unlikely to foster the appropriate habitat conditions required for colonization by Ute ladies'-tresses. Therefore, there is little potential for this species to be impacted directly or indirectly by the proposed project. Furthermore, the Project is not expected to increase the potential cumulative impacts on this species.

Table 4.4. Federally Listed, FS Sensitive, and MIS Potentially Found within the Thunder Basin Project Area.

Species	Status	Potential for Occurrence in the Project Area	Presence of Habitat(s) in the Project Area
black-footed ferret <i>Mustela nigripes</i>	E	Very Unlikely	Limited
bald eagle <i>Haliaeetus leucocephalus</i>	T	Possible	None
Ute ladies'-tresses <i>Spiranthes diluvialis</i>	T	Very Unlikely	None
black-tailed prairie dog <i>Cynomys ludovicianus</i>	S/MI**	Resident	Moderate
swift fox <i>Vulpes vulpes</i>	S	Possible	Moderate
mountain plover <i>Charadrius montanus</i>	S	Unlikely	None
northern leopard frog <i>Rana pipiens</i>	S	Possible	Limited
tiger salamander <i>Abystoma tigrinum</i>	S	Documented	Limited
long-billed curlew <i>Numenius americanus</i>	S	Unlikely	Moderate
western burrowing owl <i>Athene cunicularia</i>	S	Documented	Limited
upland sandpiper <i>Bartramia longicauda</i>	S	Possible	Moderate
loggerhead shrike <i>Lanius ludovicianus</i>	S	Possible	Very Limited
Baird's sparrow <i>Ammodramus bairdii</i>	S	Documented	Limited
fox sparrow <i>Passerella iliaca</i>	S	Very Unlikely	None
Townsend's big-eared bat (<i>Corynorhinus townsendii</i>)	S	Unlikely	Limited
Fringed myotis (<i>Myotis thysanodes</i>)	S	Unlikely	Limited
ferruginous hawk <i>Buteo regalis</i>	S	Confirmed	Present
greater sage grouse <i>Centrocercus urophasianus</i>	MI	Possible	Present

E "Endangered",

T "Threatened"

S U.S. Forest Service Region 2 Sensitive Species

MI Management Indicator Species for project area

* At the initiation of this project, black-tailed prairie dog was classified as a Candidate for listing under ESA of 1973. On August 18, 2004, USFWS made a finding that listing was no longer warranted and it was removed from the candidate list.

FS Sensitive Species

When analysis of this project was initiated in Spring 2002, the entire list of sensitive species for USFS Region 2 (Appendix A) was reviewed and considered for evaluation. However, only that list has recently been amended, but since the Thunder Basin project was well underway at that time, the old list is addressed in this document. Only those species that might be potentially affected by the proposed action were selected for evaluation (Table 3). Those determinations were made based on the geographic distribution and habitat requirements of each species. Justifications for excluding many of the USFS Region 2 sensitive species from evaluation are listed in the following paragraph. Occurrence in the local area, and presence of appropriate habitats and potential for occurrence on the project area are listed in Table 3 for each evaluated species.

None of the USFS Region 2 sensitive plant species had been documented on the TBNG (Appendix A) or during vegetation baseline studies at adjacent mines (vegetation baseline reports for the North Rochelle and Black Thunder Mines, 1974-2000) and therefore,). However, two of those plants are suspected to occur on the TBNG: foxtail sedge (*Carex alopecoidea*), and dakota buckwheat (*Eriogonum visheri*). Appropriate habitat (wet, shady creeks and springs; and un-vegetated, often highly disturbed sites, respectively) is not present within the Thunder Basin project area for either the foxtail sedge or buckwheat. Therefore, all USFS Region 2 sensitive plants were excluded from the list of evaluated species.

Animals that had not been documented on the TBNG were also excluded from further evaluation. Many vertebrates, and one invertebrate from the USFS list that had been documented on the TBNG were not included on the list of evaluated species because of an obvious lack of appropriate habitat in the vicinity of the project area. Most fish on the Region 2 Sensitive Species list do not occur in the headwaters of the Cheyenne River basin. The two species that do occur in the region (Appendix A) were not evaluated because 1) there are no perennial streams or permanent water sources on the project area, and 2) most discharged water will be contained on the project area and only minimal downstream flow will occur. Potential impacts on two species of bats were evaluated, but the spotted bat (*Euderma maculatum*) was excluded because of the paucity of suitable day roosts, the absence of from further evaluation because of its limited potential hibernacula, and the limited surface water resources in the area. Trees are very limited within the project area and will not be physically disturbed by the development to occur in eastern Wyoming. Appropriate habitat (moist clearings or riparian drainages within a forest, or mesic woodland margins) is not available.

Northern leopard frog (*Rana pipiens*)

The northern leopard frog is found throughout Wyoming, and considered to be relatively common (Baxter and Stone 1980, Luce et al. 1999). Breeding habitat of this frog is characterized by shallow, permanent or semi-permanent, standing water with at least some emergent vegetation (Wagner 1997). For overwintering, leopard frogs require deeper lakes or ponds with well-oxygenated water that does not freeze to the bottom (Wagner 1997). Most creeks, drainages, and impoundments on the project area are unlikely to hold water long enough into the summer to support tadpoles until metamorphosis. Furthermore, grazing and annual desiccation limit the growth of emergent vegetation such as cattails (*Typha* spp.), rushes (*Juncus* spp. and *Scirpus* spp.), and sedges (*Carex* spp.) in most wetland areas. Standing water was only found at four locations on the project area in May 2002: a stock reservoir on Trussler Creek, two small pools along Trussler Creek and a small dugout near a windmill. Although all of those sites supported rushes and sedges, the edges of the reservoirs

and dugout were trampled and eroded from livestock traffic, and the water was very murky. Turbid water has the potential to negatively affect development of eggs and tadpoles (Wagner 1997).

Tiger salamander (*Abystoma tigrinum*)

The tiger salamander is relatively common throughout Wyoming (Baxter and Stone 1980, Luce et al. 1999) and has been documented during wildlife surveys for both adjacent mines Clayton, 2004. Semi-permanent water bodies are required for breeding and to support larval salamanders through late summer (Baxter and Stone 1980). Adult salamanders are primarily terrestrial, but require protection from the sun, wind, heat, and cold. Mammal burrows often provide suitable shelter from desiccation in the summer, and even serve as overwintering sites.

Several moderate sized (4-6") tiger salamanders were seen at the outlet of a mine reservoir on several occasions during spring and summer 2003. On 28 May 2002, two desiccated tiger salamanders were discovered at the mouth of a burrowing owl (*Athene cunicularia*) nest burrow within the prairie dog colony.

Black-tailed prairie dog (*Cynomys ludovicianus*)

Black-tailed prairie dogs are relatively abundant in Campbell County. The TBNG harbors one of the seven major colony complexes remaining in North America. There are three colonies totaling 36.6 acres that are within or partially within the project area (Exhibit 1): 5.8 acres in SW¼ SE¼ Section 5; 24.3 acres in NW¼ SE¼ Section 15; and 6.5 acres in SE¼ NE¼ Section 18 (all three in T42N, R70W). No portion of those colonies will be physically disturbed by the proposed development. However, the colony in Section 18 is within about 165 yards of a proposed well site.

Swift fox (*Vulpes velox*)

Swift foxes typically prefer flat to gently rolling, short or mixed-grass prairies, generally lacking in shrubs or woody vegetation (Cotterill 1997). Swift foxes use multiple den sites year round for shelter, protection from predators, and rearing young. Burrows of fossorial mammals such as badgers (*Taxidea taxus*) and prairie dogs are often modified for those purposes (Carbyn et al. 1994).

Swift fox sightings are very rare in central and southern Campbell County. The species has only been documented once by TWC biologists during 22 years of wildlife studies at coal mines in the Powder River Basin (TWC unpubl. data). On the night of 27 March 2002, TWC biologists saw one swift fox in SW¼ SE¼ Section 15, T42N, R70W; less than ½ mile southeast of the biological survey area boundary. USFS records (obtained from Cristi Lockman, Wildlife Biologist for the Douglas Ranger District) do not reveal any sightings on the project area. However, those records do indicate four observations between 1995 and 1997 within five miles of the project area. No swift fox were observed during spotlight surveys on 16 June 2002.

Townsend's big-eared bat (*Corynorhinus townsendii*)

The Townsend's big-eared bat occurs throughout most of western North America (Clayton, 2004). This bat occupies a wide variety of habitats (i.e., desert scrub, sagebrush, chaparral, deciduous and coniferous forests), but is strongly associated with the availability of caves or

cave-like features. Large and deep caves are required for maternity roosts and hibernacula. Smaller caves, buildings, and bridges are used during summer for both day and night roosts. This species forages primarily on moths, but beetles and flies are also regularly consumed.

The Townsend's big-eared bat is unlikely to occur within the project area because of the absence of adequate roosting habitat (e.g., caves and abandoned buildings) in the vicinity. Any use of the area by that species would be limited to nocturnal foraging. Infrastructure associated with the proposed development is unlikely to adversely affect foraging bats, and most activity associated with the Project will be diurnal. Consequently, the Project is not expected to have any measurable impacts (direct or indirect) on Townsend's big-eared bat populations in the area. Furthermore, the Project is not expected to increase the potential cumulative impacts on this species in the region.

Fringed myotis (*Myotis thysanodes*)

The fringed myotis occurs throughout western North America, mostly west and south of Wyoming (Clayton, 2004). Isolated populations exist in eastern Wyoming. The species is often associated with montane and upland forests, but also occurs in desert scrub and grassland habitats. Caves and abandoned mine shafts are used for maternity roosts and hibernacula. Buildings and conifer snags are often used during summer for both day and night roosts. This species forages mostly on flying beetles.

The fringed myotis is unlikely to regularly occur within the project area because of the absence of adequate roosting habitat (e.g., caves, abandoned buildings, and snags) in the vicinity. Trees are very limited within the project area and will not be physically disturbed by the development. Any use of the area by fringed myotis would be limited to nocturnal foraging. Infrastructure associated with the proposed development is unlikely to adversely affect foraging bats, and most activity associated with the Project will be diurnal. Consequently, the Project is not expected to have any measurable impacts (direct or indirect) on fringed myotis populations in the area. Furthermore, the Project is not expected to increase the potential cumulative impacts on this species in the region.

Long-billed curlew (*Numenius americanus*)

The long-billed curlew is a relatively uncommon summer resident of grasslands and sagebrush-grasslands in Wyoming (Luce et al. 1999). That curlew prefers to nest in areas with large open expanses of grassland, with relatively low vegetation and few shrubs (Hill 1998). Lakeshores and river valleys are often used during fall as migration staging areas (Hill 1998).

Curlews are uncommon in the TBNG (TWC unpubl. data) and have not been documented nesting in southern Campbell County (Luce et al. 1999). They have only been observed twice (both times as spring migrants) since 1989 at adjacent coal mines (Clayton, 2004). One of these sightings (April 1996) was of four long-billed curlews feeding in a crested wheatgrass (*Agropyron cristatum*) field near the edge of the project area in NW¼ NW¼ Section 10, T42N, R70W. No long-billed curlews were observed on the project area during surveys in May 2002 or 2003.

Ferruginous hawk (*Buteo regalis*)

Ferruginous hawks nest throughout Wyoming and occupy portions of the state during winter (Luce et al. 1999). Large expanses of grassland and shrubland, where livestock grazing (vs.

cultivation) is the predominant land use, provide the most suitable habitat (Schmutz 1989, Johnsgard 1990). Typical nest sites include small trees, hilltops, rock outcrops, eroded banks, and even relatively level ground (Bechard and Schmutz 1995). The ferruginous hawk primarily relies on two families of mammals for the majority of its food; *Leporidae* (rabbits and hares) and *Sciuridae* (ground squirrels and prairie dogs).

The topography and prey base (jackrabbits, cottontails, and prairie dogs) of the project area provide good quality habitat for the ferruginous hawk. At least 12 nests that were either built, or previously used by ferruginous hawks are present on or near the project area.

The proposed development will not physically disturb any of the 12 ferruginous hawk nests, and all facilities will be at least 0.5 mile from 10 nests. One nest is approximately 0.5 mile from a proposed well. Another is within 0.5 mile of a proposed well and within 0.25 mile of a proposed pipeline.

Burrowing owl (*Athene cunicularia*)

The burrowing owl is a summer resident of open rangeland habitats throughout Wyoming (Luce et al. 1999). That owl requires burrows of fossorial mammals, primarily badgers and prairie dogs, for nesting and roosting (Haug et al. 1993). Most burrowing owl nests within the TBNG are found in prairie dog colonies (Clayton, 2004). One pair of burrowing owls nested in the prairie dog colony in 2002. Also, owls nested at the prairie dog colony in each year from 1999 through 2001 (Clayton, 2004).

Upland sandpiper (*Bartramia longicauda*)

The upland sandpiper is an uncommon summer resident of the eastern plains of Wyoming (Luce et al. 1999). Nest sites are typically in grassy areas with sparse sagebrush, often near water. Although some habitats on the project area may be suitable for upland sandpipers, none were seen or heard during surveys in May 2002 or 2003. Upland sandpipers are common in the area and have been documented regularly at adjacent mines (Clayton, 2004)

Mountain plover (*Charadrius montanus*)

Mountain plovers are summer residents in Wyoming, where they nest in areas with level terrain, sparse vegetation, and short grass (<4 inches) (Knopf 1996). Prairie dog colonies generally provide the best habitat for mountain plovers in the Powder River Basin.

Loggerhead shrike (*Lanius ludovicianus*)

The loggerhead shrike is a common summer resident throughout Wyoming (Luce et al. 1999). Shrikes inhabit relatively open, heterogeneous habitats with perches for hunting, and thorns, sharp twigs, or barbed wire for impaling prey (Yosef 1996). This species will use a wide variety of trees and shrubs for nesting (Prescott and Bjorge 1999).

Baird's sparrow (*Ammodramus bairdii*)

The Baird's sparrow has been recorded in southern Campbell County, and other parts of northeast Wyoming, but has not been documented nesting there (Luce et al. 1999). This sparrow usually nests in areas with relatively tall dense grass and sparse low shrubs, such as *Symphoricarpos* spp., *Rosa* spp., and *Elaeagnus* spp. (Rising 1996). Although Baird's sparrows

show a preference for ungrazed to lightly grazed native pastures, they also nest among introduced grasses and even alfalfa (*Medicago sativa*) (Rising 1996).

Fox sparrow (*Passerella iliaca*)

The fox sparrow is a common year-round resident in western Wyoming, and has been observed in eastern portions of the state, including southern Campbell County (Luce et al. 1999). This sparrow usually nests in dense deciduous riparian thickets (Rising 1996). During winter they inhabit riparian thickets and woodland-chaparral (Rising 1996).

Management Indicator Species

In accordance with the recently adopted (July 2002) Land and Resource Management Plan for the TBNG, the greater sage-grouse (*Centrocercus urophasianus*) was selected as the Management Indicator Species to be evaluated for this project, (as defined for the Hilgait Bill Geographic area). The selection of Management Indicator Species is based on the following criteria: 1) public issues or management concerns expressed concerning certain species or groups of species, 2) endangered or threatened species listed nationally or by the state of Wyoming, 3) species that have limited or special habitat requirements that may be significantly influenced by management practices resulting from land use allocation, 4) species that represent the habitat requirements for a larger group of species.

The greater sage-grouse occurs year-round throughout the non-forested regions of Wyoming (Luce et al. 1999). Sage-grouse rely on a variety of habitats within a sagebrush dominated landscape to reproduce and survive throughout the year. Early in the spring, grouse gather at leks or breeding display sites. Lek sites are usually open areas such as playas, ridge tops, or burned areas that are surrounded by dense escape cover. After being bred, hens typically scratch out a nest under sagebrush (Connelly et al. 1991) within three kilometers of the lek (Schroeder et al. 1999). Nest success is enhanced where both sagebrush and residual grass cover are taller and denser (Gregg et al. 1994). For the first month after hatching, the young depend on more open sagebrush stands with an abundance of forbs and insects, especially ants and beetles (Drut et al. 1994, Schroeder et al. 1999). Late season brood rearing habitats, such as wet meadows and bottomlands, are more mesic and support greater forb cover (Drut et al. 1994). Sage-grouse use a variety of habitats during fall, and the incidence of sagebrush in their diet increases as forbs become less available. During winter, grouse eat sagebrush leaves almost exclusively. Winter range is characterized by large expanses of dense sagebrush. Where snow accumulations are significant, gentle south- and west-facing slopes, or windblown ridges are preferred.

The range of sagebrush density and height on the project area represents potential year-round habitat for sage-grouse. Although mesic bottomland habitat for brood rearing was limited on the project area, it was no less abundant than in other portions of southern Campbell County. Wyoming Game and Fish Department records (obtained from O. Oedekoven, Wildlife Biologist, WGFD, Gillette, WY) revealed no sage-grouse leks within the biological survey area. The nearest active lek (Payne) is located 5 miles to the southeast. A historic lek site (Black Thunder) approximately 3 miles north of the survey area has not been active since 1994. No grouse were documented on the project area during lek searches or other field work conducted for adjacent mines during Spring 2003 (TWC unpubl. data). Also, no grouse or grouse sign were found during surveys conducted for Yates in May 2002. Radio-collared grouse from the adjacent Rochelle lek complex, which includes the Payne lek, have not been documented

nesting or rearing young within the project area (TWC unpubl. data). However, several radio-collared individuals did use portions of the project area during winter 2001-02 and 02-03. (TWC unpubl. data).

Sage-grouse populations have generally declined throughout Wyoming for at least the past four decades. Since 1994, regional populations (Wyoming Game and Fish Department Sheridan Biological Region) have exhibited one period of increase and a subsequent decline (see Figure 1, Clayton, 2004 pg 28). Unfortunately, available data do not allow a direct comparison of trends between the Sheridan region and the TBNG. However, lek count data from the TBNG do suggest a similar increase in grouse during the late 1990's (Figure 2, Clayton, 2004 pg 28). The disparity between regional and TBNG trends since 2000 is probably a function of increased survey effort (i.e., more leks checked) within the TBNG during that period. The regional trends account for variations in survey effort whereas the TBNG trends do not. Nevertheless, sage-grouse populations within the project area and TBNG are probably responding to the same factors as those throughout the remainder of the region. The TBNG Land and Resource Management Plan provides for habitat management practices and development restrictions to improve and protect sage-grouse habitat and populations. Continued monitoring of grouse within the TBNG will allow for an assessment of and how implementation of the Plan is benefiting grouse populations.

Summary

As previously addressed, populations of, or habitats for, the black-footed ferret, Ute ladies'-tresses, Townsend's big-eared bat and fringed myotis would not be adversely affected by the alternatives. Therefore, they are not discussed further in this EA. Species that could be affected by the alternatives are discussed in the following sections.

4.8.1 ALTERNATIVE A – PROPOSED ACTION

Direct, Indirect and Cumulative Effects:

Federally Listed Species

Bald eagle

The paucity of water and trees on and near the project area essentially precludes the use of that area by bald eagles for nesting or roosting. The small trees described in a previous section are wholly inadequate for nesting or roosting. Also, there are no consistent or significant food sources on the project area that would attract large numbers of eagles. Discharge of water from the Thunder Basin CBM project will not enhance existing reservoirs to a degree that will improve foraging habitat for bald eagles. Use of the project area by bald eagles is expected to be minimal. Nevertheless, foraging eagles could be exposed to traffic associated with the Project and additional human activity. Consequently, the Project could have minimal direct and indirect impacts on bald. The Project could increase the potential cumulative impacts on this species in the region. Potential impacts to bald eagles from the Thunder Basin CBM project are consistent with those outlined in Chapter 4 (environmental consequences) of the *Final Environmental Impact Statement and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project*, and with the Biological Assessment and Biological Opinion associated with that document.

All wells and the central gathering facility for the Project will be supplied by underground power lines. Most of the wells will initially be powered by propane or natural gas generators. At some point, new overhead power lines will be constructed by the local utility to provide service to two power drops within the project area. The local utility is obligated to ensure that new power transmission lines conform to the recommendations of the Avian Power Line Interaction Commission guidelines (EEI/RRF 1996). Those guidelines are recognized by the USFWS as the best practices currently available to prevent or minimize raptor electrocutions. Consequently, the Project is not expected to increase the electrocution risk to bald eagles.

Cumulative Effects

Cumulative effects are defined as the incremental impacts of past, present, and reasonably foreseeable future actions conducted by any entity (federal, state, private, etc.). In the past, lands within the project area, and the Hilgert Bill geographic unit of the TBNG in general, have been used for livestock grazing, coal mining, and CBM development, hunting, and dispersed recreation. In addition to the proposed project, future activities will probably include a continuation of those activities, and an increased rate of CBM development and coal mining.

The proposed project may have minor direct and indirect impacts to bald eagle and could likely contribute to an overall negative cumulative impact to the species based on past and foreseeable future development. While the impacts from this project and other activities in the area do not appear to threaten viability of the population at this time, continued development in this area could lead to a loss of viability. Furthermore, the proposed project will not conflict with the current Grassland Plan, or any future objectives to manage the area and provide habitat for any federally listed species.

Table 4.5 Determinations of effect and their primary justification for federally Endangered and Threatened species on the Thunder Basin CBM project area.

Evaluated Species	Determination	Justification
Black-footed ferret	No effect	No physical disturbance of appropriate habitat.
Bald eagle	May affect, not likely to adversely affect	Limited potential for vehicle or power line collisions.
Ute ladies'-tresses	No effect	No suitable habitat.

FS Sensitive Species

Northern leopard frog

Because appropriate wetland habitat is very limited on the project area in most years, northern leopard frogs are unlikely to occur on the project area. Nevertheless, the species could occur in the area and may be affected (e.g., dispersing individuals killed by traffic associated with Project) by the proposed development. Conversely, the discharge of water from the proposed CBM developments may enhance wetland habitat both on and near the project area. Reservoirs in the area may receive enough discharged water to provide suitable year-round habitat for leopard frogs. Planned erosion controls and water discharge permits (regulated by the Wyoming Department of Environmental Quality) should ensure that leopard frogs and other aquatic organisms will not be negatively affected by increased sedimentation or degraded water chemistry (i.e., concentrations of salts and metals) resulting from the discharge of CBM produced water.

Tiger salamander

The limited wetlands and mammal burrows (ground squirrel, badger, and prairie dog) on and near the project area probably provide adequate habitat to support a modest salamander population. It is unlikely that the proposed development will negatively affect breeding, sheltering, or foraging habitat. However, traffic associated with the Project could result in increased salamander mortalities. Conversely, the discharge of water during gas extraction will enhance wetland habitat, both on and near the project area, resulting in a net benefit to the salamander population. Planned erosion controls and water discharge permits (regulated by the Wyoming Department of Environmental Quality) should ensure that salamanders and other aquatic organisms will not be negatively affected by increased sedimentation or degraded water chemistry (i.e., concentrations of salts and metals) resulting from the discharge of CBM produced water.

black-tailed prairie dog

Some prairie dogs will likely be subjected to increased vehicle traffic and other disturbances associated with the drilling and maintenance of that well. Conversely, areas disturbed by drilling and pipeline installation might be colonized by prairie dogs dispersing from that colony (KMC, personal observation).

Despite the limited potential for increased vehicle collisions near one colony, the Project is not expected to have any measurable impacts (direct or indirect) on prairie dog populations in the area. Furthermore, the Project is not expected to increase the potential cumulative impacts on this species in the region.

Swift fox

The presence of marginal habitats (i.e., dense sagebrush stands), rarity of the species in the region, and paucity of sightings in the area make it unlikely that swift fox regularly inhabit the project area. However, nevertheless, swift fox could visit the area and be exposed to traffic associated with the Project. Also, proposed facilities will eliminate and fragment areas of marginal habitat. Consequently, the proposed development has limited potential to adversely affect the species. The Project could have minimal direct and indirect impacts on the swift fox. The Project could also increase the potential cumulative impacts on swift fox in the region.

Long-billed curlew

The high density of shrubs on most of the project would essentially preclude curlews from nesting there. Also, there are no significant wetlands that might attract large numbers of curlews during migration. Despite those habitat limitations, curlews could visit the project area, and be exposed to traffic associated with the Project. Improvements in wetland type habitat resulting from discharge of CBM produced water could attract individual birds, but are not likely to attract large numbers. Furthermore, the Project is not expected to increase the potential cumulative impacts on this species.

Ferruginous hawk

The proposed development will not physically disturb any of the 12 ferruginous hawk nests. The Avian Power line Interaction Commission Guidelines should help ensure that the Project will not significantly degrade the quality of existing nest sites or increase the electrocution risk to raptors. The construction and maintenance of roads, power lines, gas wells, pipelines, and facilities will alter very few acres of the project area. Direct impacts on ferruginous hawks are unlikely, but increased traffic and activity could disrupt nesting activities or result in vehicle collisions. Indirect impacts, such as the loss of foraging habitat during the project, are not expected to negatively affect the survival or reproductive success of any hawks. Nevertheless, the new facilities and increased activity associated with this project could degrade the landscape enough to deter future use of the area by ferruginous hawks. The Project could also increase the potential cumulative impacts on the species in the region.

burrowing owl

Although the proposed development is unlikely to directly affect burrowing owls, some potential foraging habitat will be fragmented and increased vehicular traffic could pose a risk to owls nesting in the area. The Project could also increase the potential cumulative impacts on the species in the region.

Upland sandpiper

The proposed development will disturb a limited amount of upland sagebrush-grassland that could potentially be used for nesting, brood rearing, and foraging. Sandpipers in the area will also be exposed to traffic associated with the Project. The Project could also increase the potential cumulative impacts on the species in the region.

Mountain plover

No mountain plovers were seen in any of the prairie dog colonies on the project area when they were surveyed and mapped on 28 and 30 May 2002. Furthermore, the moderate density of sagebrush within the colony renders it as marginal plover habitat. Outside of prairie dog colonies, grasses and shrubs are generally too tall and dense to provide suitable mountain plover habitat. The proposed CBM development will not physically disturb any prairie dog colonies. Because remaining portions of the project area are unlikely to host nesting plovers, the Project is not likely to have any direct effects on the mountain plover. It is possible that plovers could be indirectly affected by the Project or that the development could increase the potential cumulative impacts on this species in the region.

loggerhead shrike

No loggerhead shrikes or shrike nests were found during field surveys in May 2002. However, most trees on the project area could provide adequate nest sites. Development (i.e., drilling, construction, and pipeline installation) and maintenance activities are not likely to adversely affect shrikes that might inhabit the project area. However, the limited disturbance and fragmentation of upland habitats could have minimal negative impacts. Care should also be taken not to damage or kill any existing trees on the project area through construction activities or hydrological changes.

Baird's sparrow

Baird's sparrows have been documented a few times during baseline and monitoring surveys for adjacent coal mines, mostly as spring migrants. The most recent documented occurrence of a Baird's sparrows were heard or seen on the project area was during surveys in May 2002. However, one was heard singing early spring 2002 (TWC unpubl. data). Habitats on and near the project area (primarily sagebrush dominated) are not appropriate for nesting Baird's sparrows. Consequently, there is little potential for the species to nest in the area, and no direct or indirect impacts are expected from the proposed development. Nevertheless, migrating individuals could visit the area and be exposed to traffic associated with the Project, possibly resulting in mortalities. Because Baird's sparrows do not regularly nest in the area (i.e., southern Campbell County), the Project is not expected to increase the potential cumulative impacts on this species.

Fox sparrow

Habitats on and near the project area (primarily sagebrush dominated) are not appropriate for fox sparrows. Consequently, they are not expected to occur in the area or be negatively impacted (directly or indirectly) by the proposed development. Nevertheless, migrating individuals could visit the area and be exposed to traffic associated with the Project, possibly resulting in mortalities. Because fox sparrows do not regularly occur in the area (i.e., southern Campbell County), the Project is not expected to increase the potential cumulative impacts on this species.

Cumulative Effects

Cumulative effects are defined as the incremental impacts of past, present, and reasonably foreseeable future actions conducted by any entity (federal, state, private, etc.). In the past, lands within the project area, and the Hilight Bill geographic unit of the TBNG in general, have been used for livestock grazing, coal mining, and CBM development, hunting, and dispersed

recreation. In addition to the proposed project, future activities will probably include a continuation of those activities, and an increased rate of CBM development and coal mining.

Cumulative environmental impacts of the aforementioned activities may have already, or could in the future, adversely affect significant habitat for, or populations of, USFS Region 2 Sensitive Species. The proposed project will not conflict with the current Grassland Plan, or any future objectives to manage the area and provide habitat for USFS Sensitive Species.

Table 4.6 Determinations of effect and their primary justification for U.S. Forest Service Region 2 Sensitive Species in the Thunder Basin CBM project area.

Evaluated Species	Determination	Justification
Northern leopard frog	May impact individuals but is not likely to cause a trend to federal listing or loss of viability	Limited potential for vehicle collisions.
Tiger salamander	May impact individuals but is not likely to cause a trend to federal listing or loss of viability	Potential for increased vehicle collisions.
Black-tailed prairie dog	May impact individuals but is not likely to cause a trend to federal listing or loss of viability	Limited potential for increased vehicle collisions.
Swift fox	May impact individuals but is not likely to cause a trend to federal listing or loss of viability	Some physical disturbance of marginal habitat and increased risk of vehicle collisions.
Townsend's big-eared bat	No impacts	Little suitable habitat.
Fringed myotis	No impacts	Little suitable habitat.
Long-billed curlew	May impact individuals but is not likely to cause a trend to federal listing or loss of viability	Limited potential for vehicle collisions.
Ferruginous hawk	May impact individuals but is not likely to cause a trend to federal listing or loss of viability	Some physical disturbance of habitat and increased human activity.
Burrowing owl	May impact individuals but is not likely to cause a trend to federal listing or loss of viability	Some physical disturbance of foraging habitat and increased risk of vehicle collisions.
Upland sandpiper	May impact individuals but is not likely to cause a trend to federal listing or loss of viability	Some disturbance of potential nesting habitat.
Mountain plover	May impact individuals but is not likely to cause a trend to federal listing or loss of viability	Limited disturbance and fragmentation of marginal habitats.
Loggerhead shrike	May impact individuals but is not likely to cause a trend to federal listing or loss of viability	Limited disturbance and fragmentation of upland habitats.
Baird's sparrow	May impact individuals but is not likely to cause a trend to federal	Limited potential for vehicle collisions.

	listing or loss of viability	
Fox sparrow	May impact individuals but is not likely to cause a trend to federal listing or loss of viability	Limited potential for vehicle collisions.

Management Indicator Species

Greater sage grouse

There are no known greater sage grouse leks within the area of project disturbance. Implementation of the proposed action would not move any grouse habitat away from its desired condition because of the proposed use of existing roads (Final Environmental Impact Statement for the Powder River Oil and Gas Project USDI BLM 2003, Vol 2 pg 4-257, 4-266, 4-269), and would comply with the standards and guidelines for greater sage grouse leks in the Grassland Plan (USDA FS 2002 pages 1-18 through 1-19).

In addition, the construction and maintenance of roads, power lines, gas wells, pipelines, and facilities would result in the short-term disturbance of approximately 27.44 acres of potential yearlong habitats for greater sage grouse.

Access roads could provide convenient travel corridors for mammalian predators, thus increasing the predation risk to grouse. Additional traffic during construction and production phases could pose an increased risk of vehicle collisions for grouse that inhabit the area. All of these could lead to an adverse impact on greater sage grouse and its habitat.

The discharge of water into drainages and reservoirs on and near the project area could potentially improve greater sage grouse foraging habitat as the density of forbs, a valuable component of the greater sage grouse's diet, is usually higher in wet bottomlands and around permanent water sources. However, the increase in standing water creates habitat for mosquitoes which are carriers of West Nile Virus. West Nile Virus is currently negatively impacting grouse populations in the Powder River Basin.

The proposed development will have some impacts on sage-grouse habitat on or near the project area. The construction and maintenance of roads, power lines, gas wells, pipelines, and facilities will alter very few acres of the project area. Nevertheless, those features will fragment native habitats, and the landscape in general. Linear habitat disturbances (i.e., roads and pipelines) can provide convenient travel corridors for mammalian predators, thus increasing the predation risk to grouse. Pipeline routes, auxiliary roads, and well sites should be reclaimed with native seed mixtures to minimize the permanent impacts on habitat. The discharge of water into drainages and reservoirs on and near the project area could potentially improve sage-grouse habitat.

Despite the absence of leks on the project area and the limited documented use of the area by radio-collared grouse from a nearby lek complex, it is unlikely that sage-grouse regularly inhabit the past, infrastructure and activity associated with the project area. Nevertheless, potential direct impacts could act to sage-grouse from proposed activities include mortalities caused by additional vehicle traffic and displacement of grouse from historical use areas and some grouse could be exposed to increased traffic hazards in the area. Local grouse populations may experience an increase in predation risk due to linear habitat disturbances (i.e., roads and pipelines) that can provide convenient travel corridors for mammalian predators, and

any new above ground power lines that provide additional perching opportunities for golden eagles (*Aquila chrysaetos*).

Cumulative Effects:

In the past, lands within the analysis area, and the Hilight Bill geographic unit of the TBNG in general, have been used for livestock grazing, coal mining, conventional oil and gas and CBM development, hunting, and dispersed recreation. In addition to the proposed project, future activities will probably include a continuation of those activities, and an increased rate of CBM development and coal mining.

Cumulative environmental impacts of the aforementioned activities have already and will continue to adversely affect sage-grouse populations and habitats. Although the Thunder Basin CBM project will alter relatively few acres of land, it will increase fragmentation of native habitats, and the landscape in general. Fragmentation and increased human activity (e.g., traffic, visual and auditory disturbances, etc.) associated with this project could displace some individuals, reduce their reproductive success, or cause increased mortality. Those potential impacts compounded by other developments, livestock grazing and West Nile Virus in the vicinity of the project area could potentially affect populations of sage-grouse. However, given the absence of active leks within the analysis area and only limited use of the project area by grouse from the nearest lek complex, the project is not expected to increase the potential cumulative impacts to a point that will result in a loss of viability or extirpation of local grouse populations at this time. Continued development in this area could lead to a loss of viability in the future. The proposed project will not conflict with the current Grassland Plan, or any future objectives to manage the area and provide habitat for Management Indicator Species.

4.8.2 ALTERNATIVE B – NO ACTION

Direct and Indirect Effects: Under the No Action Alternative, the approximately 13.97 acres proposed for long-term disturbance under the Proposed Action would not be disturbed by CBM development activities, therefore eliminating the reduction and fragmentation of habitats for the burrowing owl, upland sandpiper, greater sage grouse, and ferruginous hawk that would potentially occur under the action alternatives. The desired conditions for the mountain plover, burrowing owl, greater sage grouse, ferruginous hawk, as discussed under Chapter 3.0, would continue to be met under the No Action Alternative.

As discharge of water during gas extraction would not occur, reservoirs and wetland habitats would not be enhanced, therefore any beneficial effects on species using those wetland habitats (northern leopard frogs and tiger salamanders) would also be eliminated.

Cumulative Effects: Under the No Action Alternative, upland vegetation types would remain undisturbed by CBM development activity. These habitats would remain available for sensitive wildlife use within the project area and greater cumulative impact assessment area of the Powder River Basin EIS.

4.9 FISHERIES MANAGEMENT

The alternatives would not affect fisheries management for the following reasons: 1) no known fishery resources exist within the project area; and 2) as produced CBM water would be contained in an existing reservoir or used immediately, as in the case of the Boss Draw outfall, discharge of the produced water into drainages and subsequent flow to watersheds supporting fishery resources would be minimal. Given that fishery resources would not be directly or indirectly affected by the project, the resource is not discussed further in this document.

Cumulative impacts are addressed in the Powder River Basin EIS (4-235 through 4-249). Due to the scale of this project activity, the contribution to cumulative effects from this project would be minimal.

4.10 SOILS

Soils in the Project Area are developing in mostly residuum of the nearly level to gently sloping (0-6 percent) upland high plains that dominate the Project Area, and in alluvium of the gently sloping drainage bottoms (NRCS, 1998, GIS maps). Approximately 14 soil units (Table 4.5) have been mapped by the NRCS in the Project Area (NRCS, 1998, GIS maps). Tributaries to the ephemeral streams of Little Thunder Creek and Porcupine Creek dissect the upland plains. Slopes up to 45 percent are located in small areas associated with these stream channels. Sandstones, siltstones, mudstones, and shales of the Wasatch and upper Fort Union Formations are the principal parent materials.

The dominant soils of the upland plains are predominantly sandy loam to loam/clay surface soils or topsoils over loam to clay loam, to clay subsoils, respectively, that are moderately deep to deep, well-drained, and nearly level to gently sloping (1-6 percent) (Table 4.6) (NRCS, 1998). Soils of dissected valley sides and upland hills are mostly sandy loams to loams over loams to clay loams to clays, respectively, exhibiting soil depths that are shallow to moderately deep, well-drained, and gently sloping to steep (6-45 percent). The alluvial drainage bottoms are occupied by loams to clay loams over clay loams to clay that are deep, well drained, and nearly level to gently sloping (0-6 percent).

The potential for high/severe water erosion hazard is limited to the mostly moderately deep to shallow soils of the steeper valley sides and hills. Factors contributing to high water erosion hazards are slope, soil erodibility factor (k-factor), and soil permeability (rate of water infiltration) (BLM, 2003, p 3-81).

Deep, saline, and sodic soils in alluvial bottomlands have elevated salinity and sodic (SAR) levels in subsoil horizons below the topsoil layers. Heavier textured, clayey soils are that are susceptible to accumulating proportionally elevated sodium levels (in comparison to calcium and magnesium levels) in the subsoil and are most likely to exhibit adverse effects on soil conditions which occur in the project area (BLM 2003, p 3-86). Clayey soils, particularly clayey soils whose clay fraction is comprised mostly of swelling, smectitic clay minerals, are also more susceptible to shrink-swell action and compaction that can affect a soil's ability to support construction and long-term operations of a facility. Compaction can adversely affect revegetation and associated reclamation potential (BLM 2003, p 3-82). More detailed information is available from the Gillette NRCS office.

Table 4.7 General Soils Information – Aerial Extent of Soil Units

Map Unit	Map Unit Name	Percent of Area
110	Birdman Loam	5.8
113	Birdman-Ulm Loams	0.8
129	Decolney-Hiland Sandy Loams	14.0
144	Forkwood Loam	0.9
148	Forkwood-Ulm Loams	17.7
156	Hiland Fine Sandy	0.8
157	Hiland-Bowbac Sandy Loams	3.6
159	Hiland-Vonalee Sandy Loams	21.8
205	Samday-Savageton Clay Loams	1.8
208	Savageton-Silhouette Caly Loams	5.5
214	Theedle-Kishona Loams	3.4
215	Theedle-Kishona Loams	5.2
227	Ulm Clay Loam	7.2
228	Ulm-Renohill Comple	11.5

Source:(NRCS, 1998, GIS maps).

Table 4.8 Study Area Soil Series Characteristics

Map Unit	Major Soil Series	Slope Range (%)	Erodability K Factor	Wind Erosion Group ³	Salinity (mmhos/cm) ⁴	SAR	Permeability (inches/hour)	Shrink/Swell Potential
110	Birdman Loam	0-6	0.37	5	0-0	0-0	0.06-0.2	High
113	Birdman-Ulm Loams	0-6	0.37	5	0-0	0-0	0.06-0.2	High
129	Decolney-Hiland Sandy Loams	0-6	0.32	3	0-0	0-0	0.6-2.0	Moderate
144	Forkwood Loam	0-6	0.37	5	0-0	0-0	0.6-2.0	Moderate
148	Forkwood-Ulm Loams	0-6	0.37	5	0-0	0-0	0.06-0.2	High
156	Hiland Fine Sandy	0-6	0.32	3	0-0	0-0	0.6-2.0	Moderate
157	Hiland-Bowbac Sandy Loams	0-6	0.32	3	0-0	0-0	0.6-2.0	Moderate
159	Hiland-Vonalee Sandy Loams	0-6	0.32	3	0-0	0-0	0.6-2.0	Moderate
205	Samday-Savageton Clay Loams	3-15	0.37	4L	0-4	0-5	0.06-0.2	High
208	Savageton-Silhouette Clay Loams	0-6	0.43	4L	0-0	0-0	0.06-0.2	High
214	Theedle-	0-6	0.37	4L	0-4	0-5	0.6-2.0	Moderate

	Kishona Loams							
215	Theedle-Kishona Loams	6-20	0.37	4L	0-4	0-5	0.6-2.0	Moderate
227	Ulm Clay Loam	0-6	0.37	6	0-0	0-0	0.06-0.2	High
228	Ulm-Renohill Comple	0-6	0.37	5	0-2	0-0	0.06-0.2	High

¹Soil erodibility factor. It is the rate of soil loss per rainfall erosion index unit. Values range from 0.02 to 0.69.

²A group of soils having the same runoff potential under similar storm and cover conditions.

³A grouping of soils that have similar properties affecting their resistance to soil blowing in cultivated areas.

⁴A measurement of the amount of soluble salts in a soil expressed millimhos per centimeter.

⁵Ratings, ranging from good to unsuitable, characterize the ability of soil material to support the re-establishment of vegetation. The ratings are based on the soil's texture, coarse fragment percentage by volume, percent organic matter, pH, salinity, available water retention capacity, and permeability (USDA FS, 1979).

Salinity levels for the predominant soils in the project area (Table 4.6) are low to moderate (less than 2 mmhos/cm to 6 mmhos/cm). The suitability for use in reclamation of most of the dominant soils in the project area is fair (USDA FS, 1979) (Table 4.6).

4.10.1 ALTERNATIVE A – PROPOSED ACTION

Direct and Indirect Effects: Impacts to soils from the construction of CBM production facilities, access roads and pipelines would include:

- Removal of protective vegetative cover and loss of soil/vegetative productivity;
- Increased exposure of surface soil materials to accelerated erosion from blading and/or compaction of soil materials; and
- Loss of soil profile development, soil structure, and nutrients from soil excavation and mixing of soil horizons.

Soils on an estimated 27.44 acres of land may be affected by CBM development activities in the Thunder Basin project area. Of this, an estimated 13.97 acres of land would have soils affected by long-term disturbances related to construction of production facilities, roads, and pipelines under the Proposed Action.

During site preparation prior to construction of facilities, vegetation is removed and soil is disturbed and compacted. These acts of breaking up and exposing the soil to erosive forces can accelerate soil loss from wind and water erosion until vegetative cover is reestablished. Accelerated soil loss would be minimized by limiting the following: the removal of vegetation; the leveling of work area; and the location of wells on slopes that would require cuts-and-fills for well pad construction. Because the Proposed Action calls for well placement in less steep areas which will not require drill pad leveling and cuts-and-fills, soil loss due to water erosion will likely be effectively controlled during construction through best management practices for the control of runoff and sediment transport. Timely initiation of reclamation and revegetation efforts

should effectively and immediately control accelerated soil loss due to either wind or water erosion. Effective reclamation efforts would minimize both short- and long-term impacts.

The largest single impact on the soil resource resulting from CBM development would be soil disturbance from use of linear unsurfaced, two-track roads and construction of buried pipelines (pod gathering, trunklines, and water discharge). Runoff, particularly channelized flows in road tracks and pipeline rights-of-way, which have been compacted and/or cleared of vegetation, can be high and can result in accelerated erosion where slopes are steep or long. However, the Proposed Action calls for minimizing road construction that would require cuts-and-fills. Pipeline and utility corridor construction also will avoid steeper slopes where possible. Where necessary, erosion control features, such as water bars other means of diverting flows off sloping pipeline right-of-Way, would be constructed to control increased runoff and erosion

With the implementation of effective reclamation practices, vegetative cover would likely return to a mostly natural appearance in the project area within two to three years (USDI BLM 1998 – Personal communication with Brian Pruiett, Natural Resources Specialist). However, soil loss would likely increase substantially in the short-term following disturbance until reclamation measures become effective in controlling runoff. Following construction, erosion control measures and/or features will need to be continued and maintained until adequate vegetative cover is re-established, channelized flows (rill and gully features) are eliminated, and the re-establishment of protective vegetative cover is achieved. Reclamation practices used on previous CBM projects in the Powder River Basin have resulted in limited accelerated soil erosion and a high level of reclamation success (USDI BLM 1996).

Soil materials typically are mixed during underground pipeline construction. When less productive subsoil becomes mixed with the topsoil (surface soil horizon or layer), overall reclamation potential and effectiveness in re-establishing vegetation in the disturbed area can be reduced. Compaction from pipeline construction vehicles also can reduce the effectiveness of a revegetation program as compacted soils can inhibit moisture and air infiltration and limit vegetative success.

The suitability for reclamation of all of the dominant soils in the project area is “fair” on a scale ranging from “good” to “unsuitable” (Table 4.6).

A specific impact to topsoil and potentially, reclamation suitability, may occur should produced water from CBM wells be discharged at points within closed basins. Water discharged within a closed basin will drain to the low point in the basin or playa. Although the accumulation of salts in the playa bottoms within the project area has not occurred in most case under natural precipitation and runoff conditions, the sustained release of produced water from CBM wells may add additional salts to the playa soils, resulting in an elevation of salinity levels over time. Salts accumulate in closed basins as water is evaporated, leaving its dissolved minerals behind as solids. Both long-term ponding of water and the periodic ponding of water followed by evaporation and drying of the playa bottoms could change soil conditions by increasing salinity, which may alter the composition of vegetation supported by the playa bottom.

Also, regardless of the salinity levels in the inflows and playa soils, the long-term ponding of playa bottoms would alter soil/playa bottom conditions and would result in changed soil conditions. Continuous wet soils would “kill off” the existing vegetative cover as most of the species are dryland species and are not “water loving.” The absence of a living cover would likely allow for an invasion of weedy species, potentially noxious weeds, which may take hold and be difficult to replace, even with desirable adapted species.

The development of saline and wet soil conditions would be minimized by locating discharge points in existing reservoirs where water will not accumulate in playa situations. With the implementation of proper construction and impact avoidance and mitigation measures, soil and soil erosion conditions would continue meet the desired conditions as discussed in Chapter 3.0.

Cumulative Effects: Impacts to soil resources within the Thunder Basin project area would be relatively minor given the small scale of the Proposed Action. However, any increase in surface disturbance incrementally adds to the effects of erosion, compaction, and sediment yield within the greater CIAA. The Powder River Basin EIS considers this Proposed Action as part of the cumulative analysis for impacts to soils (p. 4-141).

4.10.2 ALTERNATIVE B – NO ACTION

Direct, Indirect and Cumulative Effects: Under the No Action Alternative, soil resources within the project area would remain affected by current land uses; primarily livestock grazing, vehicle traffic, and existing oil and gas development. Soil and soil erosion conditions would continue meet the desired conditions as discussed in Chapter 3.0.

4.11 CULTURAL RESOURCES

Site file searches and Class III (intensive pedestrian) cultural resource inventories were conducted on the Thunder Basin POD by Frontier Archaeology and Greer Services (Brunette, 1999 and Greer, 2002). The Class III inventories and searches of site files maintained by the Wyoming State Historic Preservation Office (SHPO) Cultural Records Office revealed two cultural sites and isolated finds within the project area. However, these cultural resources are not eligible for nomination to the National Register of Historic Places. The Forest Service has consulted with the SHPO and has determined, and SHPO has concurred, that the alternatives would not have adverse direct, indirect or cumulative effects on historic properties or cultural resources (USDA FS, 2003). Therefore, the resource is not discussed further in this EA.

4.12 PALEONTOLOGICAL RESOURCES

The project area is located within the Early Eocene Wasatch Formation in Campbell County. This geologic unit is known to yield fossils, and any fossils that are found tend to be significant. Persistent work in this geologic unit over the past 60 years has yielded invertebrates, mammals, birds, fish, amphibians, and reptiles. This formation has a Fossil Yield Potential Classification of 5 which is described as a “Highly fossiliferous geologic units that regularly and predictably produce vertebrate fossils and/or scientifically significant nonvertebrate (plant and invertebrate) fossils, and that are at risk of natural degradation and/or human-caused adverse impacts” (USDA FS, 2002b., Appendix J, pg J-4). A Certification of Acceptance for the site paleological survey was issued for the proposed area on April 24, 2003, resulting in no significant fossils discovered. Based on impact avoidance and mitigation measures proposed in Section 2.5 of this EA, the alternatives have a direct, indirect or cumulative impact on paleontological resources, and the existing condition of paleontological resources would continue to meet the desired condition (see Chapter 3.0). Therefore, the resource is not discussed further in this EA.

4.13 RECREATION RESOURCES

The Forest Service classifies recreation environments into a Recreation Opportunity Spectrum (ROS) that includes Primitive, Semi-primitive Non-motorized, Semi-primitive Motorized, Roaded Non-motorized, Roaded Natural, Roaded Modified, Rural, and Urban. Each ROS category, from Primitive to Urban, includes progressively more developments and evidence of human activity. The Thunder Basin project area is composed of the “Roaded Natural” ROS categories. The existing condition of the area meets the desired condition discussed in Chapter 3.0.

The Thunder Basin National Grassland, while lacking many of the attractions often sought by recreationists in other parts of the National Forest, does provide a variety of recreation opportunities. No developed recreation sites (i.e., campgrounds, picnic areas, boat ramps, scenic overlooks, interpretive service centers, trail heads) are found within the Thunder Basin project area. The project area and surrounding region of the TBNG’s main role is to provide wildland recreation and hunting opportunities for both residents and non-residents. The area attracts hunters during September and October during the greater sage grouse and sharp-tailed grouse season. Pronghorn and mule deer season run concurrently from early to mid/late October. Rabbits and predators are hunted later during the autumn and winter.

During other seasons, the TBNG and project area attracts small numbers of visitors engaged in dispersed recreation activities such as, camping and hiking, wildlife observation, outdoor photography, and sight-seeing.

4.13.1 ALTERNATIVE A – PROPOSED ACTION

Direct and Indirect Effects: There is expected to be little change in existing levels of dispersed recreation activities on public lands surrounding the project area as a result of CBM development under the Proposed Action. Existing levels of recreational activity are expected to continue on these lands. The area would continue to meet the desired condition for recreation discussed in Chapter 3.0. Current ROS categories (“Roaded Natural”) would not be altered by the Proposed Action. The primary recreational effects of the Proposed Action would fall under the following categories: hunting opportunity, public access and noise.

Hunting Opportunity

Recreational hunting opportunities may increase locally within the project area, as populations of game animals may increase locally within the project area in response to increased availability of water and forage. However, increased access and human activity associated with CBM development may cause wildlife avoidance of the immediate project area during the construction period.

Public Access

The development of access roads and well facilities will result in greater physical access to the project area. Pipeline installation along existing access roads is likely to inconvenience recreational visitors to the project area who may use affected roads to access recreational opportunities. Construction activities may also limit recreational use of roads temporarily, as well as degrade the visual quality of the recreation experience. Road access is likely to be restored to existing uses within a few days or few months, once construction or installation activities have been completed.

Noise

Construction-related noise could reduce the overall quality of the recreational experience. However, construction-related increases in noise would be short-term and generally, restricted to the immediate vicinity of the construction work. One additional compressor located on adjacent private land will add noise to a nearby area.

Cumulative Effects: As previously stated, there is expected to be little change in existing levels of dispersed recreation activities on public lands surrounding the project area as a result of CBM development under the Proposed Action. The Proposed Action will not change either the ROS of the Project Area or the recreational opportunities afforded the public. The primary potential effects of the Proposed Action are limited to increases in public access, increases in hunting opportunity due to increases in big game populations as a result of CBM water, decreases in wildlife use of the area due to human presence, and a temporary decrease in the visual and audio quality of the recreational experience during the construction phase. These “adverse” impacts will occur in an area already heavily impacted by industrial interests. Also, the type of recreation user, as stated above, is generally employed by local industry and therefore more tolerant of the visual and audio presence. In the context of cumulative effects, these potential impacts incrementally add to both the beneficial and adverse recreation effects of oil and gas development on public lands in the Powder River Basin.

4.13.2 ALTERNATIVE B – NO ACTION

Direct and Indirect Effects: Under the No Action Alternative, the area would continue to meet the desired condition discussed in Chapter 3.0. Dispersed recreational use and opportunities would remain at existing levels. The No Action alternative will not change either the ROS of the Project Area or the recreational opportunities afforded the public. Hunting opportunities would not be improved, as the expected increase in wildlife populations due to CBM water would not occur. On the other hand, there would no potential decrease in wildlife use of the area due to increased human presence and activities. Public access to the project area would not be increased as existing roads would not be upgraded and new roads would not be constructed. Conversely, recreational visitors that use existing roads would not be limited by the presence of pipelines. Noise and visual quality experienced by recreationists would remain at existing levels.

Cumulative Effects: No cumulative effects on recreation resources are anticipated under the No Action alternative.

4.14 VISUAL RESOURCES & NOISE

Visual Resources

The landscape of the Thunder Basin project area is characterized by open sagebrush-steppe, low rolling hills, and unobstructed views of many miles. Oil and gas field development, coal mining, and grazing activities are evident in parts of the project area. County roads, FS roads and utility lines are evident throughout the study area as well.

The Medicine Bow National Forest has inventoried Scenic Integrity Objectives (SIOs) for NFS lands. The FS management objectives for visual resources within the TBNG are to provide for characteristic landscapes that satisfy the adopted SIO. The Thunder Basin project area lands

are managed in accordance with the SIO of “low”. The existing condition for visual integrity currently meets the desired condition as discussed in Chapter 3.0.

Noise

The project area has land uses associated with sparsely populated rural regions. Background noise measurements have not been made in the Thunder Basin project area. Background noise levels for the EPA category “farm in valley” are: daytime, 29 dBA; evening, 39 dBA; and nighttime, 32 dBA. Local conditions, such as topography and frequent winds, can alter background noise conditions. The unit of measure used to represent sound pressure levels (decibels) using the A-weighted scale is (dBA). It is a measure designed to simulate human hearing by placing less emphasis on lower frequency noise because the human ear does not perceive sounds at low frequency in the same manner as sounds at higher frequencies.

4.14.1 ALTERNATIVE A – PROPOSED ACTION

Direct and Indirect Effects:

Visual Resources

Drill site preparation, drilling, and well completion activities would be accomplished using drilling rigs, backhoes, graders, or dozers and well servicing equipment. During a period of one to three days, these activities would be an impact into the viewscape at each drill location. The visual intrusion of these activities would be site-specific and would not be likely to affect visitors outside the viewshed of each drill site within the Thunder Basin project area.

Construction activities would be evident to people using roads within the project area. Users of the area would be impacted by the sight and dust of construction activities. In addition, the transport of equipment and materials to the project area would be evident to other travelers on local highways that would be used to access the site.

Long-term impacts over the 10 to 20 year Life-Of-Project (LOP) would result from the addition of the wells to the landscape, and the disturbance of lands utilized for associated facilities such as central gathering/metering facilities, all-weather roads, and two-track roads.

All wells and facilities under the Proposed Action would be consistent with FS SIO for the TBNG, currently rated as “low”, which will remain “low” with project implementation. Adverse visual impacts would be minimized through careful location of facilities, minimal disturbance of affected sites, and design of facilities so that they harmonize with the surrounding landscape. Visual integrity of the project area would continue to meet the desired condition for visual integrity (see Chapter 3.0).

Noise

The U.S. EPA (U.S. EPA 1974) has established an average 24-hour noise level of 55 dBA as the maximum noise level that does not adversely affect public health and welfare. No definitive data have been established concerning noise levels that affect wildlife or livestock. No standards concerning quantitative noise levels have been established by the State of Wyoming, BLM, or FS. Therefore, lacking any quantitative statutory guidelines, noise levels above 55 dBA are considered an adverse noise impact for this EA.

Noise levels would be temporarily elevated above the rural background noise of 35 to 40 dBA during the construction of the 10 CBM wells and associated roads and facilities. Construction

related noise would result from vehicle traffic, construction equipment and drilling rigs. Locally, noise could be elevated above the 55 dBA threshold discussed above. However, activities at each drill site would occur for only five to ten days during the short drilling period. Therefore, well pad construction activities would not cause any significant noise impacts. Construction related noise would last approximately 30 days for pipeline/utility corridors in each POD. Adverse noise impacts would be local in nature, usually only affecting areas within ¼ mile of the noise producer. Noise from production facilities would not exceed 49 decibels (10dBA) above background noise within ¼ mile of greater sage grouse leks or ferruginous hawk nest sites.

Cumulative Effects: CBM development in the Thunder Basin project area is not expected to change the visual character of the existing rural landscape within the project area and greater CIAA. The short-term noise impacts due to construction would not adversely affect cumulative noise levels within the CIAA. Long-term noise effects from the operation of the 10 proposed wells would be minor in terms of CBM operation throughout the entire CIAA. However, from a cumulative impact standpoint, noise from each well incrementally adds to overall noise levels within the greater area. Elevated sound levels are local phenomena. On a windless day, most noise will fade to background levels in less than a mile. The cumulative effects of noise would be that noise will be distributed at more locations in the area.

4.14.2 ALTERNATIVE B – NO ACTION

Direct, Indirect and Cumulative Effects: Under the No Action Alternative, visual resources would remain affected by existing land uses including vehicle traffic on FS and County roads, activities associated with grazing, hunting and other recreational activities, and existing oil and gas development. Noise levels would also remain affected by existing land uses. Visual integrity of the project area would continue to meet the desired condition for visual integrity (see Chapter 3.0).

4.15 SOCIO-ECONOMIC RESOURCES

The Thunder Basin project area is located within Campbell County. There are two incorporated municipalities affected by the proposed project; Gillette and Wright. Gillette is the county seat and is the largest incorporated city in Campbell County. Wright is located in southern Campbell County.

Mineral production of coal, oil, and gas is the dominant economic activity in Campbell County. Wyoming is the top producing state in the United States. More than 90% of the coal produced in Wyoming comes from Campbell County (Campbell County Chamber of Commerce 1998). Campbell County also produces approximately 25% of the oil produced in Wyoming each year.

Agriculture, consisting of livestock production and dryland farming, also is an important sector of the economic base within Campbell County. According to the Campbell County Economic Development Corporation (CCDEC 1997), the livestock population in the county consists primarily of cattle and sheep. Most cropland in the county produces wheat, barley, oats and hay for feed.

The largest employment sectors in Campbell County are mining, retail trade, government and services (WDOE 1998). The per capita income in Campbell County averaged \$21,908 in 1996. Total personal income for the county in 1996 was approximately \$700 million, which accounted

for 6.8% of the 1996 total personal income for the State of Wyoming, approximately \$10.4 billion (USDC BEA 1998). Total 1996 personal income earned from the mining sector, including oil and gas extraction, was nearly \$250 million, representing 42.2% of the total personal income for the county (USDC BEA 1998).

Further socioeconomic affected environment data is available in the Powder River Basin EIS, pages 3-275 through 3-290.

4.15.1 ALTERNATIVE A – PROPOSED ACTION

Direct, Indirect and Cumulative Effects: Ongoing CBM field development in the Powder River EIS study area (including the Thunder Basin project area) is likely affecting the socioeconomic environment. Quantitative impacts are not yet known from proposed and existing development within the project area and greater Powder River Basin EIS study area. However, construction and operation of CBM fields are resulting in additional direct and indirect employment opportunities. CBM-related jobs are also generating millions of dollars in additional wages, salaries, and taxes. In addition, producing wells, such as those proposed by Yates, are generating millions of dollars in federal royalties, fee royalties, and taxes (severance, ad valorem, sales, and use). Some of these monies would accrue to the State and counties.

Much more detailed analyses of socioeconomic impacts are available in the Powder River Basin EIS, pages 4-336 through 4-356.

4.15.2 ALTERNATIVE B – NO ACTION

Direct, Indirect and Cumulative Effects: Under the No Action Alternative, socio-economic benefits to the U.S. Treasury from CBM development within the Thunder Basin project area would not occur. CBM minerals would continue to be drained from non-federal acreage resulting in a loss of potential federal royalties and taxes. CBM gas would either continue to be drained or would be lost entirely due to migration from the open coal seam mining.

4.15.3 Environmental Justice

Executive Order 12898, signed by President Bill Clinton on February 11, 1994, and titled “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations”, provides that Federal agencies will make environmental justice part of their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of Federal programs on these populations. The Order requires the Forest Service to ensure effective public notification and access to information about the proposed action, to work to gain public participation in the analysis and decision processes, and to mitigate such effects if they could occur.

The racial and economic status and composition of the community and persons living in and near the proposed project area in Campbell County, Wyoming was considered during a review of what effect the proposed Thunder Basin Coal bed Methane Well Field development project could have on socio-economic conditions in the analysis area. This review considered whether or not minorities, low-income populations or American Indian tribes are present in the area that could or would be affected by the project.

Public scoping for and about the site-specific proposed action included contacts with American Indian tribes known or presumed to have an interest in mineral development projects occurring on the Thunder Basin National Grassland. All local landowners, Campbell County Commissioners, the potentially affected grazing association and the general public, were contacted directly or otherwise made aware of the proposal. Local landowner, county, tribal and general public representation participation was sought in a manner consistent with Forest, agency and departmental regulations and policy, and with government-to-government relationships between the United States and tribal governments.

After examining the possible environmental and human impacts of the decision that will be made about the project, the ID team and District Ranger are of the opinion that there are no disproportionately high and adverse human health or environmental effects that would occur to minority or low income groups, or American Indian tribes, and that the public involvement efforts undertaken by the ID Team and District Ranger were adequate to have identified such groups if they exist, or had an interest in the project.

Affected environment discussions of Environmental Justice are addressed in detail in the Powder River Basin EIS, pages 3-287 through 3-290. Environmental Justice impact analyses are available in the Powder River Basin EIS, pages 4-357 through 4-358.

4.16 UNAVOIDABLE ADVERSE IMPACTS

Under the Proposed Action, unavoidable adverse impacts (i.e. impacts that cannot be completely mitigated) include the disturbance of 27.44 acres of federal surface in the short-term and 13.97 acres in the long-term. This disturbance would remove native vegetation, provide habitat for noxious weeds, disturb soils, and result in increased erosion due to wind and water. Under the Proposed Action alternative, some increased runoff and sediment could reach local waterways during and after high volume storm of long duration such as a typical 10-year storm event, and could include produced water of lower quality than that in receiving water courses. Surface disturbance would also reduce wildlife habitat, forage for livestock grazing, and may reduce recreational opportunities. Additional temporary impacts to wildlife would occur due to noise and human activity, especially during construction, drilling and testing. Some additional particulate emissions would occur in the short-term, especially during construction operations. Some minor changes in topography would occur due to cuts-and-fills associated with construction of roads. Some loss of unidentified artifacts and/or fossils may occur, and some loss of visual quality would occur. Some small spills of, or exposure to, hazardous materials could occur. Under the No Action alternative, some economic benefits would be lost and benefits of produced water for wildlife and livestock would be lost. None of these possible impacts is expected to be significant, and those that could occur can be mitigated.

The Powder River Basin EIS discussed unavoidable adverse impacts in detail on pages 4-405 through 4-407.

4.17 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

An irreversible and irretrievable commitment of resources is defined as a permanent reduction or loss of a resource that, once lost, cannot be regained. The primary irreversible and irretrievable commitment of resources from the proposed project would be the removal and use

of the existing CBM reserve(s) at the target coal (Wyodak). There may still be oil and gas in other formations of the lease. Other irreversible and irretrievable commitments of resources would include soil lost through wind and water erosion; temporary loss of productivity (i.e., forage, wildlife habitat) from lands devoted to project activities during the time those lands are out of production and until they are re-vegetated; inadvertent or accidental destruction of paleontological resources during construction and increases in illegal collecting; and loss of any animals due to mortality during earthmoving activities or by collisions with vehicles.

Refer to Powder River Basin EIS, USDI BLM 2003, pages 4-407 through 4-408 for further discussion of Irreversible and irretrievable effects of the Proposed Action.

4.18 SHORT-TERM VS. LONG-TERM PRODUCTIVITY

For the purposes of this EA, short-term use of the environment is that use during the 10 to 20 year life of the project (LOP), whereas long-term productivity refers to the period after the project is completed and the area is reclaimed and re-vegetated. Short-term use of the environment would not affect the long-term productivity of the project area or adjacent areas. After the project is completed and disturbed areas reclaimed, the same resources that were present prior to the project would be available, except for the gas and water that was removed. Water resources would slowly recharge in the dewatered coal seams; however, the rate of recharge is currently unknown. It may take 10 to 20 years or more after individual components of the project (e.g., well pads, roads) are abandoned for some of the reclaimed areas to attain shrub conditions comparable to pre-disturbance levels; however, reclamation would provide conditions to support wildlife, livestock, and recreation. Use of the project area during the LOP would not preclude the subsequent long-term use of the area for any purpose for which it was suited prior to the project.

5.0 CONSULTATION AND COORDINATION

The Forest Service consulted the following individuals, federal, state and local agencies, tribes, and non-Forest Service personnel during the development of this EA (see also Appendix B: List of Scoping Notice Recipients).

Douglas Ranger District ID Team Members:

Leo Carter, Mining and Minerals Specialist, ID Team Leader
Bill Steenson, Environmental Coordinator
Joe Reddick, Lands and Minerals Specialist
Misty Hays, Deputy District Ranger
Ian Ritchie, Archaeologist
Tim Byer, Wildlife Biologist
Claudette Moore, Hydrologic Technician
JoAnne Homuth, Paleontology coordinator
Clay Westbrook, Fire Management Officer
Nathaniel West, Oil and Gas Compliance Specialist
Clarke McClung, Rangeland Management Specialist
Amy Ormseth, Professional Engineer
Marynell Oechsner, Wildlife Biologist
Cristi Lockman, Wildlife Biologist
Jeff Sorkin, Air Resources Specialist

Federal, State and Local Agencies:

U.S.D.I Bureau of Land Management - Buffalo Field Office
U.S. Fish & Wildlife Service – Ecological Services Office
U.S. Environmental Protection Agency
State of Wyoming, Office of Federal Land Policy
State of Wyoming, Office of State Lands and Investments
State of Wyoming, Department of State Parks & Cultural Resources – SHPO
State of Wyoming, Wyoming Game & Fish Department
State of Wyoming, State Engineer's Office
State of Wyoming, Department of Agriculture

Yates Petroleum Corporation

Tim Barber, Environmental Regulatory Agent

Third Party Contractors:

Gary Holsan, Project Manager, Holsan Environmental Planning
Charles Bucans, Project Engineer, Star Valley Engineering
Kort Clayton, Wildlife Biologist, Thunderbird Wildlife Consulting

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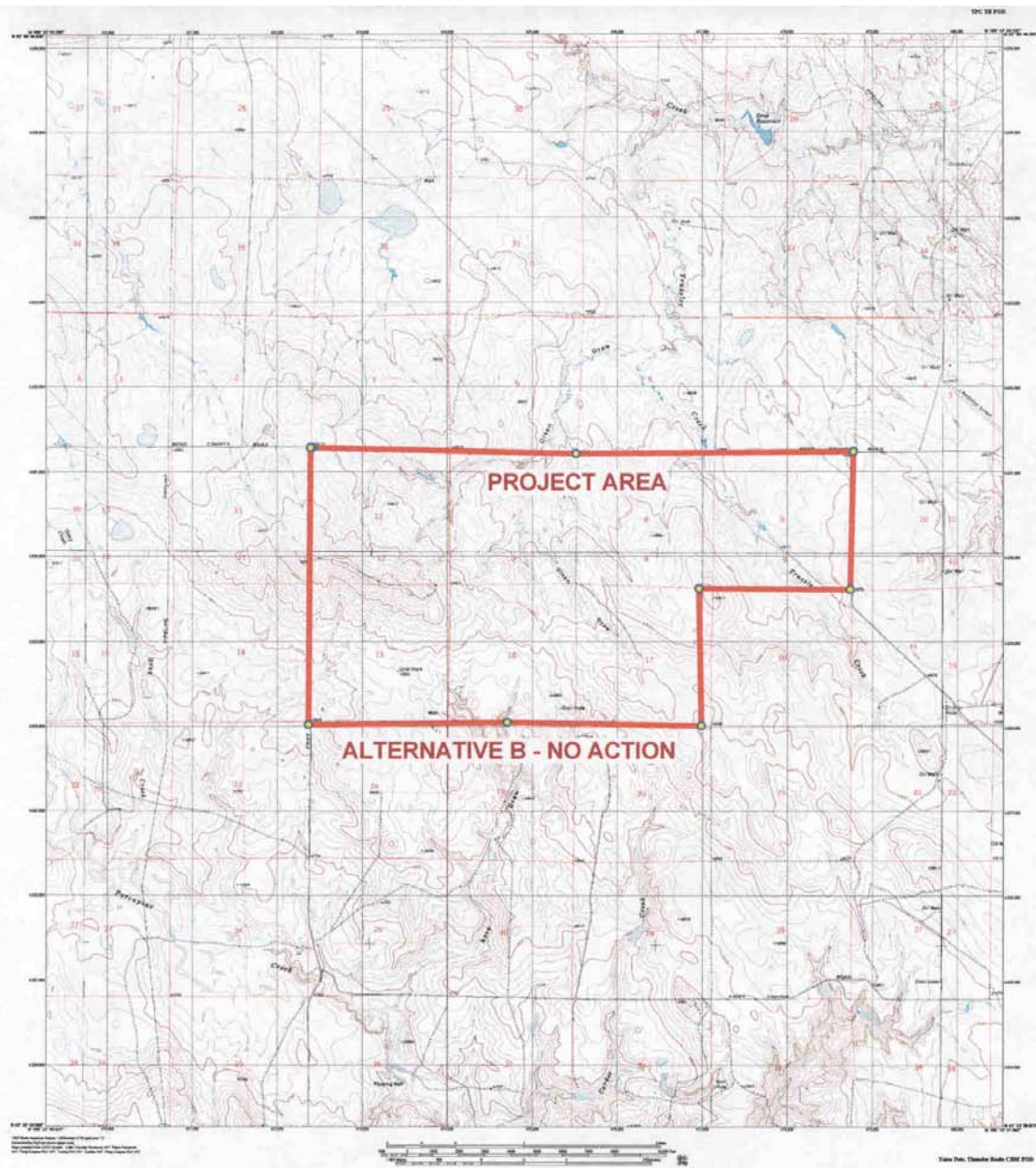
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Maps illustrating Alternatives A and B





YPC TB POD.IT3; Scale: 1" = 1.000Mi 1,609Mt 5,280Ft, 1 Mi = 1.000" , 1 cm = 634Mt

APPENDIX B

List of Scoping Notice Recipients

Chairman Tex Hall Three Affiliated Tribes Business Council 404 Frontage Rd. New Town, ND. 58763	Regulatory Affairs Manger Wendy Hutchinson Thunder Basin Coal P.O. Box 406	Board Chairman Thunder Basin Grasslands Prairie ECO 1031 Steinle Rd. Douglas, WY. 82633
Thunder Basin Grazing Assn. P.O. Box 136 Douglas, WY. 82633	Susie Downs Thunder Basin Resource Coalition 2457 Dull Center Rd. Douglas, WY. 82633	Mayor Town of Wright P.O. Box 70 Wright, WY. 82732
Permitting Engineer Brad Clark Triton Coal Company P.O. Box 3927 Gillette, WY. 82717	L. J. Turner & Mike Patchen Turner et al Wendy 318 S. Gillette Ave Gillette, WY/ 82716	WAPA University of Wyoming P.O. Box 3431 Laramie, WY. 82701
Ecological Services US Fish and Wildlife Service 4000 Morrie Ave. Cheyenne, WY. 82001	Mark R. Hymphery USDI – Office of Surface Mining 100 East “B” St. Casper. WY. 82601-1918	Western Gas Resources 12200 N. Pecos St. Denver, CO. 80234
Tom Doll Williams Production RMT Co. 300 N. Works Ave. Gillette, WY. 82716	William King Wind River Multit-use Advocates P.O. Box 785 Lander, WY. 82520-0785	Judy Wolf WY State Historic Preservation Office Barrett Bldg-2w301 Central Ave. Cheyenne, WY. 82602
John J. Hines WY. State Representative 714 W. Echita Rd. Gillette, WY. 82716	Jeff Wasserburger WY State Representative 1408 Three Forks Ct. Gillette, WY. 82716	Wyo Professional Assoc. Archeologists P.O. Box 2108 Casper, WY.82602
James A. Williams Wyodak Resources Development Corp. 131 26 HWY 51 Gillette, WY. 82718	Lisa Lindmann Wyoming Business Council 214 W 15 th St. Cheyenne, WY. 82002	Ron Micheli Wyoming Dept. of Agriculture 2219 Carey Ave. Cheyenne, WY. 82002
Julie Kozlowski Wyoming Federal Land Policy 122 W 25th St. Herschler Bldg 1 West Cheyenne, WY. 82002	Douglas Branch Wyoming Game and Fish Dept. 1078 Riverbend Douglas, WY. 82633	Olin Oedekoven Wyoming Game and Fish Dept. P.O. Box 3571 Gillette, WY. 82717
Bill Wichers Wyoming Game and Fish Dept. 5400 Bishop Blvd. Cheyenne, WY. 82006-0001	Lance Cook Wyoming Geological Survey P.O. Box 3008 Laramie, WY. 82701	Tom Darin Wyoming Outdoor Council 262 Lincoln St. Lander, WY. 82520
Kelly Matheson Wyoming Outdoor Council	Secretary Treasurer Wyoming Public Land Council	Chace a. Tavelli Wyoming State Engineer

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Laramie WY. 82073-6032

Curly Bear Wagner
Blackfoot Community College
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Blackfoot Nation
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Poplar, MT. 59255

Fort Peck Tribes
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Chairwoman Geri Small Northern Cheyenne Tribe P.O. Box 128 Lame Deer, MT. 59043	Tribal President Harold Salaway Oglala Sioux Tribe Pine Ridge, SD. 57770	Powder River Basin Resource Council P.O. Box 1178 Douglas, WY. 82633
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Douglas, WY. 82633

Nickolas A. Wylie
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New York, NY. 10128-1309

APPENDIX C

Scoping Comments and Responses

The public scoping statement addressing the Proposed Action was mailed to 111 organizations, agencies and individuals listed as parties interested in proposed activities on the Thunder Basin National Grassland, as well as to parties that may be affected by the Proposed Action, including adjacent landowners, tribal governments, the Campbell County Commissioners, the Wyoming Governor's Office and the Congressional Delegation on March 28, 2003 and was published in the *Casper Star Tribune* on April 2, 2003. A complete mailing list is provided in Appendix B.

Nine comment letters were received as a result of the scoping effort. Using the comments from the public and other agencies, the interdisciplinary team developed a list of issues and concerns to address. The FS separated the issues into four categories. 1) Those that drive alternative development. 2) Those that are analyzed in the Environmental Consequences (Chapter 4). 3) Those already decided by law, regulation, Grassland Plan, or other higher level decision. 4) Those outside the scope of the Proposed Action;

The list of respondents included:

- (1) Wendell Funk, Palmyra, Illinois.
- (2) M[ary] Katerman, Douglas, Wyoming
- (3) U.S. Environmental Protection Agency, Denver, Colorado.
- (4) U.S. Fish and Wildlife Service, Cheyenne, Wyoming.
- (5) Biodiversity Conservation Alliance and Wyoming Outdoor Council, Laramie, Wyoming.
- (6) Wyoming State Clearinghouse, Cheyenne, Wyoming.
- (7) Wyoming State Historic Preservation Office, Cheyenne, Wyoming.
- (8) Wyoming Department of Agriculture, Cheyenne, Wyoming.
- (9) Wyoming Game and Fish Department, Cheyenne, Wyoming.

Numbers in parentheses following the issue statement designate which comment letter(s) proposed the issue.

ISSUES THAT DRIVE ALTERNATIVE DEVELOPMENT

Issue 23, 24 & 25: Directional/Horizontal Drilling Whether or not employment of directional/horizontal drilling technology allows for a feasible alternative for coal bed natural gas drilling; and whether or not, regardless of the cost, the FS should force Yates to use directional/horizontal drilling techniques. (5)

Response: Directional/horizontal drilling was considered as an alternative, but was eliminated from detailed analysis as discussed in 2.4.1 pp 22-23 of the EA.

Issue 59, 61 & 62: Reinjection Whether or not reinjection of produced water is a feasible alternative to surface discharging. (1) (4) (5)

Response: Reinjection of produced water was considered, but eliminated as an alternative water disposal method as discussed in 2.4.2 pp 23-24 of this EA. Additionally, reinjection was considered and eliminated from detailed analysis in the PRB EIS as stated in Vol. 1 pp 2-65 to 2-67, on both the technical and economic feasibility. More importantly, as outlined on p 2-67 of that reference, “The ability of the BLM and FS to implement this alternative is limited. BLM and FS could not require the Companies to implement this alternative. Much of the Project Area involves non-federal minerals and non-federal surface. The BLM and FS have no jurisdiction.” The alternatives considered in detail involve returning produced water to aquifers that flow under the ground of these private lands.

ISSUES ANALYZED IN THE ENVIRONMENTAL CONSEQUENCES

General:

Issue 55: Whether or not because methane can migrate “long distances” would it become a serious danger to humans as well as fish and wildlife living in close proximity to CBM wells? (5)

Response: The potential for methane migration is addressed in Sections 2.5.1 and 4.1.1 of this EA. Methane migration mitigation, with respect to CBM wells, will be controlled by strict adherence to the APDs, COAs, BLM, and WOGCC rules and regulations that address well control, casing, ventilation, and plugging procedures appropriate to the Thunder Basin project area.

Issue 40, 67: Whether or not, since this project is one of a series of CBM developments within the Thunder Basin National Grasslands, the USFS should consider consolidating these requests into a larger, more comprehensive NEPA document that would address the cumulative impacts of CBM activity within this area. And whether or not we can continue to ignore these issues by fragmenting the comments & impacts into small lessee based parts, which serves the minimize landscape level impacts and those environmental changes that are most damaging from that point of view on private, BLM and FS lands. (2) (9)

Response: The “larger, more comprehensive NEPA... that would address the cumulative impact of CBM activity [on wildlife] within this area” that the commenter requests the USFS conduct has been completed. This programmatic, large-scale and landscape view analysis of the environmental consequences (effects) of all of the proposed coal bed methane resource development and activity in and near the project analysis area, and in much of the Wyoming

portion of the Powder River Basin, is documented in the United States Department of the Interior, Bureau of Land Management, Buffalo Field Office Final Environmental Impact Statement and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project (January 2003). The Forest Service was a cooperating agency with the BLM in the proposal undertaking and the completion of that analysis, and is now adopting the results and science of the same for site-specific analysis of local proposed CBM projects on National Forest System lands in the basin.

The description of the programmatic analysis that occurred, and the disclosure of the likely direct, indirect and cumulative effects of CBM development on wildlife in the basin, is disclosed and documented in the PRB EIS as follows:

Volume 1, Summary, pages xxvii – xxix and xxxvii – xl

Volume 2, pages 4-179 through 4-273; cumulative effects specific to wildlife species and their habitats are discussed and/or disclosed beginning on FEIS page 4-211 and in Table 4-47 on pages 4-211 through 4-215, and on pages 4-221, 4-225 and 4-226, 4-230, 4-235, 4-247 through 4-249, Table 4-57 on pages 4-258 through 4-265, in Table 4-58 on page 4-267, and on pages 4-271 through 4-273.

The site-specific, possible, and/or probable project area cumulative effects on wildlife are disclosed and discussed in sections 4.8.1 and 4.8.2 on EA pp 69 & 75.

Issue 46: Whether or not, as recommended by the USFWS, the use of utility corridors to cluster gas pipelines, water pipelines, electric lines, and access roads, etc. And using natural gas powered generators with high quality mufflers, instead of diesel, to reduce toxic emissions and keep noise to a minimum. (4)

Response: The EA and POD call for the use of utility corridors for this purpose. Utility corridors are discussed in Sec. 2.1.1, pp 18 and in Sec. 2.5, under sub-heading Visual Resources, p 27, and Land Use and Transportation, p 28 of this EA. There are no diesel powered generators or compressors proposed in the POD or EA. The Grassland Plan for the Hilight-Bill Geographic Area, in which the project is located, calls for all electric power lines of 33 KV or less to be buried. Sec. 2.1.3 (Central Gathering/Measurement Facilities) and the POD state that new underground power lines are to be installed in the utility corridors. It also states that the roads would typically serve as a common corridor for the electric lines, and the gas and water pipelines. Noise restrictions are set forth in Sec. 4.14 (Noise), p 82. In their letter dated May 9, 2003, pp 9-10 (contained in the project file) the USFWS states that utilizing these “measures would significantly reduce habitat fragmentation and acres of disturbance. These measures will reduce health risks to wildlife associated with dust and toxic compressor station emissions, and reduce noise pollution associated with compressor stations.”

Water Resources:

Issue: 50 Whether or not the proposal will have cumulative adverse impact(s) on water quality and downstream uses of water, including impact on irrigated crops that may occur downstream (i.e. the Cheyenne River or any affected tributaries) from CBM produced discharge points. (3)

Response: The POD is located primarily within the Little Thunder Creek drainage. Little Thunder Creek is a tributary to the Cheyenne River. As Section 4.4.1 states, no discharged project-related water is expected to flow downstream of the POD because of the existing reservoir on a tributary to the Little Thunder Creek would be used to contain the discharge except for an occasional flushing flow which is not expected to extend downstream to any

length. Further discussions of the potential effects of the project are discussed in Sections 4.4, 4.4.1, and 4.4.2 of this EA.

As water from the proposed wells would be predominantly contained in an existing reservoir designed to have a flushing flow. Any downstream flow from that source and subsequent impacts on water used for irrigation would be unlikely. Flow from the southern discharge point, on private surface, would be utilized by the grazing lessee and the mine downstream of the discharge point. CBM water is not expected to reach the Cheyenne River nor any locations that perform irrigation farming.

Issue 63: Whether or not the problem of aquifer recharge in relation to landowners' wells "that have gone dry as a direct result of aquifer depletion" and how long it will take to recharge aquifers will be addressed. (5)

Response: Aquifer recharge and the lithology of aquifers are discussed in Sec. 4.4 under the Ground Water sub-heading on pp 43-44 of this EA. Additionally, the PRB EIS discusses ground water impacts from CBM water at length in Ch. 4 of that document.

Issue 63: Whether or not the issues permeability, long time and nature of recharge and potential sub-strata subsidence (i.e. the collapse of an entire depleted aquifer) will be addressed.

Response: Sec. 4.4, under the heading of Ground Water, explains much of this issue, especially on pp 43-44. These pages give the transmissivity, and therefore, the recharge ability of the Wyodak Coal Seam and the overlying Wasatch aquifer.

The degree of cleating (fracturing) of the coal seam would be instrumental in the possibilities of the strata collapsing after dewatering. Generally, subsidence to the extent of noticeable surface disturbance would be on a large scale where the aquifer is/was contained in cavernous areas or where the water and coal seam were removed (as in underground mining). There are no known cavernous areas related to the Wyodak Coal Seam, and only surface coal mining exists in the area. From the amount of discharge expected from each proposed well, cleating is not expected or proven to be cavernous, nor is it believed or proven that large vugs are found in the coal seam. There have been no reported caverns or large vugs reported from coal mining operations in the vicinity, therefore, any remote possibility of collapse of the Wyodak Coal Seam from dewatering is considered insignificant. Additionally, subsidence from dewatering of unconsolidated alluvial sediments can occur, however, dewatering these type of sediments are not likely to transpire during CBM operations on FS lands.

The PRB EIS also discusses the impacts to other aquifers in Ch. 4. On pp 4-66 to 4-67 it states, "The sand aquifers of the Wasatch Formation are hydrologically separated from the coal zones by low permeability claystones."

Issue 3: Whether or not aquifers in different geologic strata are not watertight units, and whether or not coalbed methane development might dewater the target coal seam, but also dewater and/or contaminate neighboring aquifers (above or below) with natural gas or other pollutants. (5)

Response: As discussed in Sec. 4.4 under the Ground Water heading, ground water systems in the area are typically discontinuous aquifers in lenticular sand and silt bodies interbedded with shale and coal. There are two primary aquifers in the project area, both described in Sec. 4.4, pp 59-60, of the EA as is the lithology of the immediate strata in the project area. Further descriptions are found in the PRB EIS Ch. 3, pp 3-2 through 3-3. The sand aquifers of the Wasatch Formation are hydrologically, separated from the coal zone within the underlying Fort

Union Formation by low permeability claystones (PRB EIS Vol 2, p 4-66). The affects of the underlying Fort Union aquifers on the higher aquifers are discussed on p 68 of the PRB EIS, Vol 2.

It is possible that some strata above and below certain aquifers may be breached by natural fractures. This being the case, depending on water quality of the different aquifers, cross contamination may occur naturally. However, pursuant to the PRB EIS Vol. 2 p 4-56, the WOGCC and the BLM requirements for well drilling procedures ensure that each formation remains isolated as under natural conditions and the integrity of the well bore remains intact, protecting groundwater quality in aquifers drilled by CBM wells. Part of these requirements is an active well cementing and plugging programs of both active wells and wells that have been (or are to be) plugged and abandoned. As part of the drilling program in each POD or APD, CBM wells that are to be or have been drilled follow these procedures:

Producing CBM wells:

1. the well is drilled into the top of the coal (aquifer),
2. casing is then run to that depth (total depth below the top of the coal,
3. the casing is then cemented in place by injecting cement down the casing where it returns back to the surface between the casing and well bore, thereby sealing any permeable formations in the well bore as well as sealing the top of the aquifer.

Wells that are to be plugged and abandoned:

1. where casing has not been run as above, i.e. an open well bore, permeable zones in the well are located by using the well log
2. a cement plug is placed across the permeable zone, sealing it off above and below the zone.
3. a cement plug is also placed at the top of the well bore to prevent surface water infiltration.

These procedures prevent any cross contamination that would have been caused by the well bore.

Air Quality:

Issue 10: Whether or not toxic emissions for generators (especially diesel), including sulfur dioxide, nitrous oxide, carbon monoxide carbon dioxide, and formaldehyde will be addressed. And whether or not the proposed action would contribute to significant air quality concerns. (3) (4) (5)

Response: There are no diesel generators proposed for use on the project. As pointed out in the POD and in Sec. 2.1.3 of the EA, Yates proposes to use natural gas powered generators and compressors. The PRB FEIS discusses the cumulative air quality impact of regional CBM development in detail on pp 4-386 through 392. Additionally the EA discusses air quality in Section 4.3.

Wildlife Resource:

Issue 58: Whether or not the proposal will have any adverse impact on human health or safety, vegetation and wildlife (particularly burrowing mammals) from methane gas migration (5)

Response: The potential effects of the proposal on vegetation and wildlife have been addressed in Sections 4.6 through 4.8 of this EA as well as in the biological evaluation. Measures to protect sensitive species and their habitats are also discussed under Vegetation and Wildlife mitigation in Section 2.6. The proposed action would not adversely affect

threatened, endangered, or proposed species. The potential for methane migration is addressed in Section 4.1.1 of this EA.

Issue 27: Whether or not the USFS must fully analyze impact to the possible reintroduction sites for the black-footed ferret. (5)

Response: As stated in Sect. 4.8, p 60 of the environmental assessment, there are three small colonies of black-tailed prairie dogs within or partially within the project area. None of these colonies will be disturbed by the proposed project. Because of the small size and density of these colonies, there is inadequate prey available to ferrets and little potential for ferrets to occur here. Because there is an inadequate prey base, reintroduction of ferrets into the area is unlikely.

Issue 47: Whether or not, to assist in addressing potential impacts to fish and wildlife resources resulting from hydrogeological processes affected by CBM development, that a stratigraphic profile of the proposed well field containing information on well depth and major geological formations that would be penetrated during drilling should be provided. (4)

Response: This information is outlined in the drilling prognosis and APDs that are part of the project POD. The POD shall be contained in the FS decision document and would be made part of the project record. Additionally, the stratigraphic profile, APDs, and well log of each well (and surrounding wells) is kept on file and available to the public at the Wyoming Oil and Gas Conservation Commission's (WOGCC) office in Casper, Wyoming. The geology of the project area is also discussed in Sec. 4.1, p 33 of this EA and in the PRB EIS Vol. 1, pp 3-56 to 3-77.

Grazing issues:

Issue 29: Whether or not this project may affect grazing permittees, agriculture producers, landowners, and other citizens, as well as our natural resources over this area of our state. Specifically, the cumulative noise and water impacts on ranchers, agriculture producers, landowners, and grazing permittees. (8)

Response: Impacts to livestock grazing and rangeland management are discussed in Sec. 4.5 of the EA. The impacts of cumulative noise and water impacts are discussed in Ch. 4.0 under the respective subjects. The proposed action is not expected to have agricultural producers within the project area. Based on the relatively small scale of the proposed project, long-term disturbance of upland vegetation is expected to create a minimal reduction in Animal Unit Months (AUM). Water from the proposed wells in the existing reservoir, tire tank locations, and the southern discharge point will be available as watering sites for livestock within the project area.

Issues 32, 33: Whether or not, with grazing on public lands representing a vital economic value to agricultural producers and local communities, impacts on economic activity, specifically in and near the affected area, and any loss of environmental, historic, and social values of livestock grazing to the users, residents of impacted communities, and visitors to the area should be included in the scope of the study. (8)

Response: This issue has been addressed in Ch. 4.0 of the EA and the PRB EIS.

Vegetation Resources:

Issue 17: Whether or not the disturbed areas will/should be reclaimed with native soils and restored with native plants immediately after cessation of methane production. (4)

Response: No native soils are to be removed from the project area and are to be used to reclaim that area. Furthermore, the POD, COAs, Grassland Plan (p 2-21), EA (Sec. 3.1.1 p 31, Sec. 4.6, p 54), and the Biological Assessment and Biological Evaluation (BA/BE), all list the types of forbs/vegetation that are acceptable for reseeding the disturbed areas). The COAs also have a list of grasses to be used in reseeding. The District Ranger, Douglas Ranger District prior to planting, will approve all seed mixes.

Issues 6, 17: Whether sensitive, rare, and declining plant species (those listed from the data of the Wyoming Natural Diversity Database) inventories should be conducted in each project area prior to development. And whether or not potential impacts would be mitigated. (4) (5)

Response: Sensitive plant species are discussed in Section 4.8 of this EA, pp 60-76, as well as in the biological evaluation. No Forest Service sensitive species have been documented on the TBNG or during vegetation baseline studies at the adjacent coalmines. None of the action alternatives are expected to adversely impact sensitive plant species.

Issue 9: Whether or not air quality as it affects wildlife, vegetation, human health, and visibility impairment of sensitive Class I and Class II areas will be addressed. (5)

Response: Air quality affects are discussed at length in Sec. 4.3 of the EA, in the PRB EIS Ch. 3, pp 3-291 to 3-295, and Ch.4, pp 4-377 to 4-392 and Argonne, 2002.

Cumulative Impacts:

Issue 19: Whether or not this project is an illegal fragmentation in violation of 40 CFR 1506.1 whereby any project in the Powder River Basin must consider the impacts from the reasonable, foreseeable development of all the 51000 CBM wells in the Powder River Basin and analyze the cumulative impacts of these wells. The commenter states that the PRB EIS must be completed before this project can analyze the cumulative impacts. (5)

Response: The PRB EIS was issued in January 2003, with the Record of Decision (ROD) signed in April 2003. The Forest Service was a cooperating agency in the document, and has adapted it as a NEPA document. The Reasonable and Foreseeable Development (RFD) of these 10 wells is part of the RFD of the 51000 wells analyzed in the PRB EIS. The cumulative impacts of these 10 wells are part of the analysis of the 51000 wells and the cumulative impacts of the other 50990 wells were figured into the analysis of these 10 wells.

Issue 21: Whether or not the NEPA analysis should disclose the full extent of proposed development as well as direct and indirect effects of all aspects of the project and the cumulative impacts of past, present and reasonably foreseeable future actions. And whether or not cumulative impacts on all resources would be addressed in the EA. (9) (4)

Response: This was undertaken by the analysis in the PRB EIS. However, cumulative effects of these wells are discussed in Chapter 4.0 under the appropriate resource section of that chapter. Reasonably foreseeable future developments are discussed in Sections 2.1 and 4.4.1 of the EA.

Issue 22: Whether or not the EA will include a brief description of the central gathering and metering facilities, both on Federal and private land with regards to the projects cumulative impacts. (3)

Response: The central gathering and measurement facilities are discussed in Sec. 2.1.3, p 19, of the EA. The direct and cumulative impacts of these facilities are considered in Ch. 4.0 under the appropriate resource section.

Issue 49: Whether or not the discussion of total surface disturbance should include all infrastructure disturbances and their appropriate zones of influence and not be limited to actual, physical ground modifications. (3)

Response: The cumulative impacts in Ch. 4.0 under the appropriate resource section take this into consideration, as does the PRB EIS.

Issue 66: Whether or not the proposal, “as presented in the scoping statement, is as though there were only 10 wells in the Thunder Basin. The reclamation and drilling need to specifically take into account the large number of wells in the geographical area. It is important that these wells not be treated & proposed in isolation, but should take the cumulative impact of all wells in the Thunder Basin.” (2)

Response: The appropriate resource sections in Ch. 4.0 take the reclamation and drilling into account in the overall analysis. These 10 wells are part of the 51000 wells that are analyzed in the PRB EIS and therefore, are part of the cumulative impact analysis of that document.

Issue: 90 Whether or not the analysis of the cumulative effects of this proposal will adequately consider the impacts from all reasonably foreseeable CBM development in the Powder River Basin on federal, state and private land “which is estimated to be between 51000 and 139000 wells”. (5) (2)

Response: The EA addressed cumulative impact and impact from existing and reasonably foreseeable CBM development in the Little Thunder drainage under resource-specific sections in Ch. 4.0 of these EA. It adopts those parts of more extensive analysis of Past, Present, and Reasonable Foreseeable actions in the PRB EIS (USDI BLM 2003, Appendix A).

ISSUES THAT ARE REQUIRED BY LAW OR REGULATION

General:

Issue 69: Whether or not, and if so, why are two track roads required to construct or service gas wells. (1)

Response: As stated in Sec. 2.1.1, p 17, two track roads would require no blading of vegetation, thereby reducing surface disturbance. Traveling to and from the well site during the drilling and completion process will produce two track roads. The alternative of improved (crown and ditched) roads would be more of a permanently constructed road for accessing the site(s) only on a few occasional trips for maintenance, thereby resulting in more, and permanent, disturbance. One of the COAs provides restriction of access on these roads when deep rutting would result.

Issue 18: Whether or not the NEPA analysis (EA) should be deferred to the APD level. (5)

Response: The PRB EIS is a NEPA analysis of the entire Powder River Basin, a broad analysis area, while this NEPA is a more site-specific analysis, primarily for surface management issues.

Issue 51: Whether or not the three dimensions of a pit needs to be included in the analysis instead of two dimensions. (1)

Response: As discussed in Section 2.1.2, p 18, of this EA, a normal pit size for wells of this depth is 10 feet by 20 feet by 6 feet deep.

Issue 57: Whether or not since one well is on private surface with Federal minerals (split estate) will the surface use agreement, water well agreements, bonding protection, etc. be addressed? (5)

Response: This issue is addressed in Chapter 2 of this EA.

Issue 34: Whether or not Congressional mandates, Federal statutes, and implementing regulation call for multiple uses, and these mandates, statutes and regulations should be integral part of the plans for the assessments. (8)

Response: Forest Service directives, etc., require multiple uses of USFS lands. All actions involving land issues follow these mandates, statutes, and regulations.

Issue 35: Whether or not peer-reviewed science should underlie decisions and that science should be indemnified in the decisions and discussions regarding this project, especially regarding the disposition of water from the CBM wells. (8)

Response: Peer review science was used in the PRB EIS analysis and compilation. The USFS, as a cooperating agency, has adapted that document. Therefore, in that these 10 wells are part of, and were assessed with, the 51000 wells assessed in the PRB EIS, this issue has been accomplished in that document.

Issue 55: Whether or not every effort should be made to minimize the area of disturbed land. (1)

Response: One of the goals of the USFS, as outlined in the Grassland Plan, and other rules and regulations, is to keep surface disturbance to a minimum. The project area of disturbance is discussed in Sec. 2.1.1 – 2.1.6, pp 18-20 of the EA. This is also pointed out in the COAs, which are on file in the project record. As an example, a single trench is proposed for containing the electric lines, gas pipeline, water pipeline, etc.

Issue 60: Whether or not the USFS recognizes that it has the authority to impose reasonable mitigation measures with which it can require important mitigation measures to limit or eliminate adverse impacts as per 43 CFR 3101.1-2. (5)

Response: The USFS and the Douglas Ranger District do recognize they have the authority to impose reasonable mitigation measures. Pursuant to Sec. 3.0 of the EA, The Forest Service Minerals Program Policy, which states in part, “The Federal Governments policy for minerals resource management is expressed in the Mining and Minerals Policy Act of 1970, [to] ‘foster and encourage private enterprise in the development of economically sound and stable industries, and in the orderly and economic development of domestic resource to help assure satisfaction of industries, security, and environmental needs.’ Within this context, the national forests and grasslands have an essential role in contributing to an adequate and stable supply of mineral and energy resources while continuing to sustain the land’s productivity for other uses and its capability to support biodiversity goals. “We strive, through our rules, regulations,

directives, etc. to administer all programs, whether minerals, forestry or other activities, to the best of our ability, for the good of the public. We strive to, “care for the land while serving people.”

Issue 5: Whether or not as dewatering of CBM aquifers continues more coal will be exposed to the air, thereby increasing the risk of coalbed fires. (4)

Response: Coal fire is a natural process that has been occurring over millions of years. The PRB EIS addresses coal fires in Ch. 3 pp 3-76 through 3-78. Although it primarily addresses coal fire due to spontaneous combustion, it does point out that, “If near-surface coals were to burn, the introduction of methane could intensify or prolong the natural process of combustions if the methane were to burn along with the coals. Alternatively, because the gas has a lower British Thermal Unit [BTU (heat)] content than the coal, it might make a fire less intense, because the coal and methane would compete for oxygen in the combustion setting.” Also, “The BTU equivalent for coals in the PRB is 8400 to 8800 per pound, so the gas would represent only the added heat of 5 or 10 pounds of coal.” The PRB EIS *Response to Comments on the Draft Environmental Impact Statement*, Appendix S, pp S-42 through S-43, points out that combustion has been associated with water level drops in unconfined coal aquifers; however, CBM development in the PRB is occurring under mostly confined conditions. Currently, there is no information that establishes a linkage between CBM development in the PRB and coal fires.

Issue 48: Whether or not this EA “should be tiered to the Wyoming Powder River Basin (WPRB) FEIS, specifically, the water quality analysis for the Cheyenne River watershed water management plan, biological opinion, and air analysis. And whether or not this EA should present this information and/or list the pages of the FEIS on which the required information can be located.” (3)

Response: This EA does not “tier” to the PRB EIS; rather, as a cooperating agency, the USFS adapts the EIS and refers to it for analysis. Sections, chapters, and pages referenced will be used, as appropriate, to aid the public in finding those references.

Water Resources:

Issues 1, 2, 8, 13, 15, 42: Whether or not the water quality, to include the potential salinity, SAR values, and trace elements such as selenium, arsenic, barium and zinc, of discharged produced water would have adverse impacts on endangered and non-endangered vegetation and wildlife, aquatic life, domestic livestock, and agricultural crops. Also whether or not there would be any adverse impacts to the soil. These concerns are for the immediate area as well as those areas down stream that may be impacted. (3) (4) (5) (9)

Response: The direct, indirect, and cumulative effects of CBM development to surface water quality have been analyzed in programmatic environmental analyses and this analysis adopts and incorporates by reference that analysis for water purity effects (USDI BLM, 2003; p4-69 – 4-124). Which states in part “CBM produced water is expected to result in “[n]oticeable changes in water quality of main stems during periods of low flows” (USDI BLM, 2003; p2-76). ‘Concentrations of suspended sediment in surface waters [are] likely to rise above present levels as a result of increased flows and runoff from disturbed areas.’ (USDI BLM, 2003; p2-77). Water quality from a discharge well located near the project area, and believed to be representative of water quality for this project, is presented in the Water Management Plan (Greystone, 2003; p6 and Appendix 2). ‘This sample indicates excellent water quality with no negative constituent values. ... This analysis indicates relatively low TDS (437 mg/L) and has an average pH (7.34). The presence of sulfates (mg/L) was not detectable, chlorides 18 (mg/L)

and radium 0.2(pCi/L) were minimal, while the total petroleum hydrocarbons (TPH) were undetectable also. Lead (µg/L) and zinc (µg/L) were both undetectable.”

The Wyoming Department of Environmental Quality – Water Quality Division (WDEQ-WQD) is the regulatory agency with jurisdiction for water quality in the affected water bodies from this project. CBM producers are required to obtain a NPDES permit from the WDEQ-WQD prior to any discharge of water. Companies producing CBM wells are required to monitor and report on the volume and quality of produced water. Discharges are required to meet WDEQ regulations and water-quality standards (USDI BLM, 2003). Monitoring will be done as specified in the water management plan. Data derived from this monitoring will be submitted to the appropriate agencies, as required by current permitting requirements (USDI BLM, 1999; p. 2-17). NPDES permit conditions would provide enforceable assurance that water quality standards and designated uses would not be degraded from discharges of CBM produced water. (USDI BLM, 2003; p2-76).

Issue 64: Whether or not the USFS will comply with all federal, state, and local requirements respecting the control and abatement of water pollution. (5)

Response: The USFS is required to comply with other Federal, State, and local requirements with respect to water, air, and other pollutant regulations.

Issue 15: Whether or not the water discharge point on private land will be discussed, especially in the direct and cumulative impacts of the entire project and the watershed analysis area. (3)

Response: The water discharge point on private surface is discussed in Sec. 2.1.4 p 19 of the EA, as well as in the Plan of Development (POD) and Water Management Plan. It is also considered into the direct and cumulative impacts in Sec. 4.4 of the EA.

Issue 66: Whether or not long-term drought will affect, and if so, how will it affect reclamation efforts? (2)

Response: Long-term drought will affect reclamation efforts as much as it would any existing native vegetation. However, the Conditions of Approval (COA) for the POD, which are on file in the project record, states that, “Reclamation will be approved when the established vegetative cover is free of invasive weeds and equal to 70% of that of adjacent areas.” Should a long-term drought occur during the period it takes for the reseeded area to grow to the 70% cover, Yates will not be released from the responsibility of reclaiming the disturbed areas until such time as the vegetative cover meets the above criteria.

Issue 15: Whether or not the connected action of upgrading the reservoir must also be described in the EA., to include both direct and indirect cumulative impacts that water management could have on receiving aquatic and terrestrials systems. (3)

Response: Upgrading of the existing reservoir is discussed in Sec. 2.1.4, p 19 of the EA. Any improvement, modification, or reconstruction a reservoir is required to have a Wyoming State Engineer’s permit prior to any construction/reconstruction activities. Yates must have this permit before doing anything with the reservoir. Additionally, the Wyoming State Engineer’s office (WSEO) must approve the plans for any improvement, modification, or reconstruction.

Issue 53: Whether or not a reservoir modified to allow a flushing flow is more likely a downgrade rather than an up grade. (1)

Response: The existing reservoir currently allows a flushing flow. Any earth dam reservoir is designed for a flushing flow. That is the function of the spillway or overflow drainage pipe. With

out a spillway or overflow drainage pipe the dam would fail when filled to the point of overflow during substantial events.

Issues 65, 11: Whether or not increased sodium concentration leads to clay deflocculation, which would cause accelerated physical erosion. And whether or not with CBM water discharge into unlined reservoirs within a drainage channel modified “to allow discharge water to flow through in a flushing manner” would increase sodium concentrations thereby accelerating physical erosion of earthen dams with high clay content causing them to leak or fail. (5)

Response: The possibility of clay deflocculation due to increased salinity of the water contained in the existing reservoir is a remote possibility. To date there have been no known earth dam failures in the Powder River Basin caused by this problem. Additionally, all reservoirs must meet the standards of the Wyoming State Engineer’s Office (WSEO). Deflocculation can be mitigated by the addition of calcium (lime) or usually gypsum (calcium sulfate) to counter-act the deflocculation. Nothing to date suggests this is a high risk factor on the Grasslands reservoirs; there have been no failures. The PRB EIS ROD Appendix D, p D-8 outlines a monitoring requirement that requires regularly scheduled inspections and mitigation measures to prevent leaks or failure.

Issue 15: Whether or not because water may be flushed through the reservoir, would further permits be required? (3)

Response: Pursuant to Sec. 2.1.5, p 20, all applicable permits involving water storage and development will be obtained, including those with the Wyoming State Engineer (reservoirs) and Wyoming Department of Environmental Quality (National Pollutant Discharge Elimination System (NPDES) and Storm Water Drainage permits). Further discussion of permitting is found in the Water Management Plan on file in the project record.

Wildlife Resources:

Issue 17: Whether or not sensitive species of fish and wildlife and their habitats should be identified and adequate buffer zones established to protect habitat from degradation. (4)

Response: Sensitive fish and wildlife species and their habitats in and around the project area have been evaluated in the biological evaluation and disclosed in the environmental assessment in Sections 4.8 and 4.9, pp 60-76. Thunder Basin National Grassland Land and Resource Management Plan standards and guidelines for sensitive fish and wildlife species and their habitats have been applied within the project area.

Issue 38: Whether or not the proposed action would adversely affect wildlife populations due to additional vehicle collisions. (2) (9)

Response: Project roads would be constructed to a minimum standard and speed limits would be posted and enforced to mitigate effects of vehicle collisions with wildlife. However, according to the PRB EIS (p 4-183), most collisions occur on county and state roads, where speeds are higher and regulated by the state. While collisions with wildlife may occur as a result of the project, adverse effects to populations would be unlikely.

Issues 38, 54: Whether or not the company should consider consolidating traffic to the site to decrease the number of potential collisions, decrease animal displacement, and best serve the national public (1) (9)

Response: New roads will be limited to only those necessary for the project, and traffic will be limited to only those vehicles necessary for the operation. Vehicles essential for the drilling process are the drill rig and water truck. A backhoe will also be on site, but will not travel the access roads on a daily basis. Other vehicles are generally limited to service and delivery vehicles, i.e. those delivering the well casing, cementing vehicles, and well logging equipment vehicles. As a general practice, Yates usually limits daily vehicle usage to the geologist's vehicle, the company representative's ("company hand") vehicle, and one pick up truck used by the drilling crew to travel to and from the project.

Issue 26: Whether or not the EA must also address important impacts to wildlife, sensitive, threatened and endangered species. Of particular concern are the black-tailed prairie dog, swift fox, sage grouse, mountain plover, ferruginous hawk, and the black-footed ferret. (5)

Response: Impacts to threatened, endangered, proposed and sensitive wildlife species and their habitats in and around the project area have been evaluated in the biological assessment and biological evaluation. These in effect are disclosed in the environmental assessment in section 4.8.

Issue 27: Whether or not the black-tailed prairie dog is a crucial "keystone species" within this prairie ecosystem, and if so, how the connection between the reduction of prairie dogs, the reduction of habitat diversity and the resulting decline in biodiversity affects the other species associated with or adjacent to prairie dog colonies, specifically such animals as the ferruginous hawk, the burrowing owl, the Swift fox, the sage grouse and the mountain plover. (5)

Response: Impacts to black-tailed prairie dogs and other species associated with prairie dog colonies in and adjacent to the project area have been evaluated in the biological assessment and biological evaluation and disclosed in the environmental assessment in Section 4.8.

Issue 37: Whether or not seasonal ranges within the project area include yearlong ranges for the Thunder Basin Mule Deer Herd and winter/yearlong range for the Lance Creek Antelope Herd Unit exist. (9)

Response: Seasonal and yearlong habitat for mule deer and pronghorn exist within the project area. Impacts of the project to mule deer and pronghorn and their habitat are discussed in the environmental assessment in Section 4.8.

Issue 37: Whether or not there are known sage grouse leks within the sections proposed for drilling. Additional surveys for sage grouse leks and raptor nests should be done before fieldwork is permitted. (9)

Response: Sage grouse lek and raptor surveys have been conducted in and around the project area. Sage grouse and raptors and their habitats have been assessed in the biological evaluation. Impacts of the project to sage grouse and raptors are disclosed in the environmental assessment in Section 4.8.

Issue 39: Whether or not since the presence and design of power lines is a potential concern for wildlife, in that, they have an impact on sage grouse (by providing raptor perches) and to raptors themselves (from electrocution) should power lines within the project area be buried to eliminate the impact on sage grouse? (9)

Response: Pursuant to the Grassland Plan, p 2-24, the Hilight Bill geographical area's, in which the project area is located, Geographical Area Direction – Standards and Guidelines, (Special Uses) calls for all electric lines of 33 KV or less to be buried, as a guideline, except in certain situations. Additionally, the EA, Sec. 2.1.3, p 33, and the POD call for underground power lines.

Issues 44, 45: Whether or not the FS will use the new list of Threatened and Endangered Species of April 8, 2003 presented by DOI Fish and Wildlife Service as a general reference in this assessment. And whether or not the FS will implement the appropriate conservation measures as identified in the Biological Assessment and the USFWS's December 17, 2002, Biological and Conference Opinion. (4)

Response: The R2 supplement to FSM 2672 allows for updating the species list based on new information, however, when species are first designated as sensitive, current or planned Forest Service actions which are well under way (or completed) at the time of designation are exempt with regard to these Regional requirements for the newly designated sensitive species. This exemption is intended to enable projects that have been planned under previous standards to go forward without imposing new requirements. The new list was considered, however, since the project has been publicly scoped and considerable analysis has been performed, the project was designated as being "well under way", therefore, the old list is the appropriate list to use and is consistent with FSM 2672.11.

Species determined to be threatened, endangered or proposed for listing by U. S. Fish and Wildlife Service have been evaluated in the biological assessment. Standards, guidelines, and conservation measures identified in the Thunder Basin National Grassland Land and Resource Management for threatened, endangered, or proposed species and their habitats have been applied to the project area.

Issue 41: Whether or not to provide information cumulative impacts to wildlife, baseline information for species of concern should be provided. (3)

Response: Cumulative effects to threatened, endangered, sensitive and other wildlife species are disclosed in the environmental assessment in Section 4.8.

Issue 41: Whether or not human activity, noise, and light disturbances will have an ongoing, direct effect on wildlife behavior and habitat throughout the area, the extent of which is crucial for understanding the full spectrum of effects associated with this project. (3)

Response: Effects of the project on wildlife habitat and behavior are disclosed in the environmental assessment in Section 4.8.

Issues 16, 49: Whether or not the proposal will pose a threat to wildlife by fragmenting the habitat due to disruption of seasonal migration routes, and breeding activities resulting from access roads, drill pads, pipelines, power lines, compressor stations, and increased traffic, etc. (3) (4)

Response: The programmatic PRB EIS discussed this at length on pp 4-185 through 4-186. Summarized, these pages state: "The effects of habitat fragmentation and the subsequently suitability of big game ranges would depend on several factors, including current range conditions, carrying capacity, current population levels, species habitat requirements, degree of disturbance, and availability of suitable habitats. The density of facilities in some portions of the Project Area (meaning the project area for the PRB EIS) make these areas less available or fragmented to a degree that they would be unsuitable to several species of big game.

The pattern of fragmentation that would occur under this alternative would consist of the loss of narrow strips of habitats along roads, small patches at well pads and facility sites, and slightly larger patches around reservoirs and other water handling facilities."

While habitat fragmentation is possible due to CBM development, the USFS has determined that the Yates Thunder Basin project would be unlikely to lead to significant habitat fragmentation or loss of habitat effectiveness.

In their letter dated May 9, 2003, pp 9-10 (contained in the project file) the US Fish and Wildlife Service (USFWS) states that by utilizing mitigation such as clustering access roads, pipelines, and buried electrical power lines in common corridors (which is what is being done in this project) that these “measures would significantly reduce habitat fragmentation and acres of disturbance. These measures will reduce health risks to wildlife associated with dust and toxic compressor station emissions, and reduce noise pollution associated with compressor stations.”

Vegetation Resources:

Issues 1, 8, 17: Whether or not the disturbance of this project will result in the invasion of noxious weeds (including salt tolerant weeds) resulting from loss of native vegetation. Also whether or not the land management plan implements the control of noxious weeds. (5) (4)

Response: The surface disturbance of 27.4 acres would seem minimal, but the cumulative impact would add incrementally to the potentially increasing invasion of noxious weeds. However, since the project area would continue to meet the desired conditions for vegetation resources as discussed in Chapter 3.0, these impacts are not considered significant.

Reclamation:

Issues 17, 50: Whether or not the USFS has/or will provide adequate, specific reclamation requirements. And if so, whether or not the disturbed areas will/should be reclaimed with the native soils and restored with native plants immediately after cessation of methane production. (1) (4)

Response: Project site reclamation is required. The Conditions of Approval (COA) shall be contained in the FS decision document and would be made part of all permits issued. These COAs contain all steps and requirements for project site-specific reclamation. Sec. 2.1.2 calls for all disturbed areas to be reclaimed and reseeded in accordance with FS requirements. No soil is to be removed from the site. Soil removed from the reserve pits, or any excavation, and replaced during reclamation. Reclamation is also discussed in Section 2.6 of this EA.

Issue 54: Whether or it should be specified what is to be done with pit fluids before back filling the pit. (1)

Response: As outlined in the POD's Drilling Prognosis, the wells will be drilled using fresh water and air. Fluids that will be found in the pit after drilling is completed will include those discussed in the POD. Drill cuttings will also be in the pit.

Should lost circulation occur, Yates would use bentonite gel, barite or other lost circulation material, generally ground pecan or walnut shells, or cedar fiber. Therefore, remnants of this material may also be found in the pit.

The PRB EIS Record of Decision (ROD) p A-22 outlines the time requirement for pit closures - - “closed as soon as possible after suitably dry, but no later than 90 days, unless approved by an Authorized Officer (AO). Sec. A.4.2.3, - A-27, of that document also outlines what fluids are and are not allowed in the pit. In part it reads, “The only fluids/waste materials which are authorized to go into the reserve pit are RCRA exempted exploration and production waste. These include:

drilling muds and cuttings, rig wash, and excess cement and certain completion and stimulation fluids defined by EPA as exempt.”

Issue 65: Whether or not discharge of CBM water into stream channels will lead to radical flow increases thereby causing attendant acceleration of erosion and channel widening and straighten, or “channelization” which will increase the likelihood of future flash flooding. (5)

Response: Erosion control is discussed in Sec. 2.1.5 of the EA. It is also discussed in Sec. 2.5, under the Surface Water sub-heading. This reference states, “Produced water shall be discharged into existing streams and reservoirs in a manner that shall not cause increased or accelerated erosion. Energy dissipation shall be achieved through the use of rocks, placement of concrete control structures, and/or the establishment of hydrophytic vegetation.” Yates, as per, Sec. 2.6 of the EA, will monitor the discharge and downstream areas. If any erosion, i.e. channelization, head cutting, etc., is found, the USFS will be notified and Yates will perform appropriate mitigation. Guidelines for reclamation are also presented beginning on p 29 of the EA. Additional information can be found in Sec. 4.4.

Cooperating agencies:

Issues 30, 31, 36, 43: Whether or not the proposed plan should/would allow the USFS, BLM, grazing permittees, company officials and other agencies the opportunity to work cooperatively together (and on a continuing basis) with the flexibility to make the best site-specific, case-by-case decisions that are in the best interest of the affected resources and citizens. And whether or not it is imperative that FS officials have insured that all livestock grazing permittees that are directly or indirectly affected by this project are notified. (4) (8)

Response: As is evidenced in the Water Management Plan, and in the EA Appendix B, the grazing permittees were notified and took an active part in the issues in the Water Management Plan.

It is beneficial for all parties involved to continue to work together as the project proceeds. Every effort will be made to coordinate with the permittees, the BLM and other parties involved, including neighboring landowners.

Issue 41: Whether or not even though drilling and down hole operations are the responsibilities of the BLM, these actions need to be described in the EA as part of the effects discussion for this project. (3)

Response: The BLM is a cooperating agency and as such is responsible for input into the EA on the down hole operation that information is found in Sec. 2.5.1 of this EA

Socioeconomic impacts:

Issue: 66: Whether or not the proposed action will have an impact to local communities of temporary “boom time” workers. (2)

Response: Either alternative will have socioeconomic impacts on local communities. Socioeconomic impacts of the project are discussed in the EA beginning on pp 84, and in the PRB EIS on pp 4-336 through 4-356. As is evidenced in the Water Management Plan, and in the EA Appendix B, the grazing permittees were notified and took an active part in the issues in the Water Management Plan. Both were eager for the additional water that will be provided from the CBM discharge.

ISSUES THAT ARE BEYOND OF THE SCOPE OF THIS EA

Issue 14: Whether or not sedimentary rocks of chemical or biochemical origin (e.g. limestone, dolomite, gypsum), which can “redissolve”, would allow produced water to migrate through them potentially contaminating other aquifers. (4)

Response: This issue is beyond the scope of this document in that the geological setting of these strata was not favorable to the deposition of these sedimentary rocks. Geology of the project area is discussed in Sec. 4.1 of this EA, p 33.

Issue 64: Whether or not any adequate NEPA document must analyze all known effluents (particularly salinity and sodium absorption rate (SAR) values) with sufficient samples (region wide) to test by-product water from the depth of the actual coal seams. (5)

Response: Region wide sampling is beyond the scope of this EA, however, regional sampling was preformed as part of the Powder River Basin Oil and Gas Project and Proposed Plan Amendment (PRB EIS) analysis. That document discloses in Vol. 1, Ch. 3, from previous analysis of produced water, the SAR, and electrical conductivity (EC) values of the Wyodak-Anderson coal seam. These values increase to the West and North with the lowest values south and southeast of Gillette. Values for the sub-drainages in the project area are at the lowest end of the scale. Chemical analysis of CBM water is discussed in the PRB EIS Vol. 1, pp 3-11 through 3-14, which also contains tables disclosing the chemical content of CBM, produced water. Analysis of the effluents in the area of the proposed project is documented in the Water Management Plan that is part of the project file at the Douglas Ranger District office. The operators must also meet all State requirements and minimum standards for discharged water before the Wyoming Department of Environmental Quality, Water Quality Division (WDEQ-WQD), issues a National Pollutant Discharge Elimination System (NPDES) water discharge permit. Once issued, the operator must make monthly inspections and conform to the minimum standards.

Issue 56: Whether or not it is unfortunate that existing laws allow mineral leasing for mining by private parties “despite the destruction done to the public’s environment”. (1)

Response: This issue is beyond the scope of this EA in that the EA is for a coal bed natural gas project, not a mining project. No mining will occur under this permit.

Issue 15: Whether or not cumulative impacts should be identified if they extend beyond the Wyoming state line. (3)

Response: The cumulative impacts of these 10 CBM wells are part of the PRB EIS study that included impacts on neighboring states

Issue 20: Whether or not a cumulative monitoring program for the region, to include private lands should be considered. (9)

Response: Regional monitoring is beyond the scope of this document, however, the PRB EIS has provisions for regional monitoring. An interagency monitoring team and program has been implemented between Federal, State, Local, Tribal, and other responsible agencies and entities for this purpose.

Issue 7: Whether or not the Forest Service should disclose the potential effects of herbicides that might be used to kill noxious weeds and are they general defoliant for all species, all dicots, or do they affect only the target species. If not, disclosure of the potential effects of the herbicide treatment within the project area should be disclosed. (5)

Response: This issue is beyond the scope of the EA in that management of undesirable and/or noxious weeds is addressed in the Noxious Weed EA of 1996 and the resultant Implementation Plan of 2000 (these documents are on file at the Douglas Ranger District office). Additionally, noxious weed control is addressed in the COAs of the project.

Issue 27: Whether or not, and if so, how CBM impacts potential habitat to support the reintroduction of bison to this area in the future. (5)

Response: Direction for this geographical area, pursuant to the Grassland Plan, p 2-22, is for livestock grazing (livestock meaning cattle and sheep). Due to the distribution of private land within and around the project area, the probability of reintroduction of free ranging bison is extremely improbable.